VOL. XXX. No. 3 MARCH 1945

MECCANO MAGAZINE

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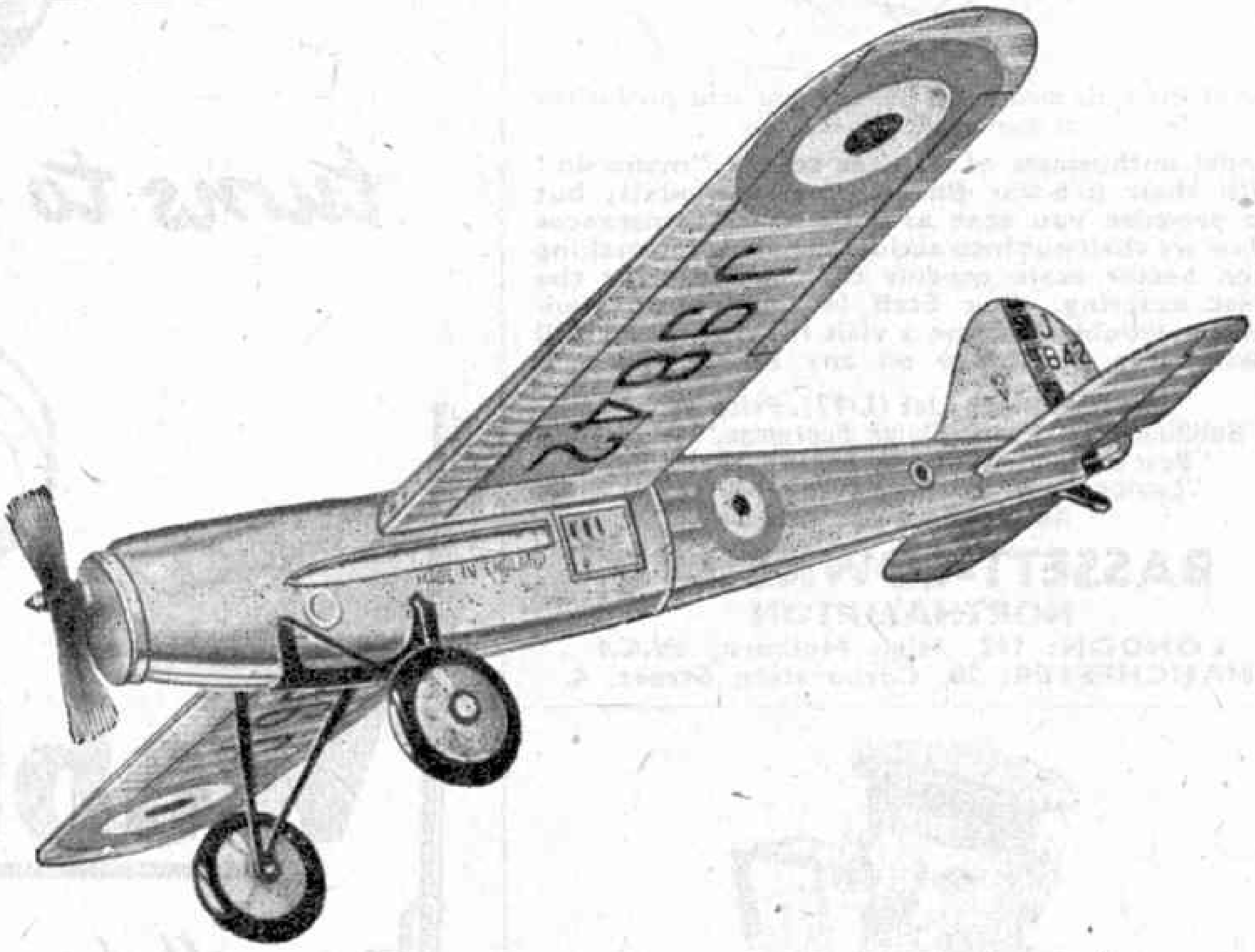

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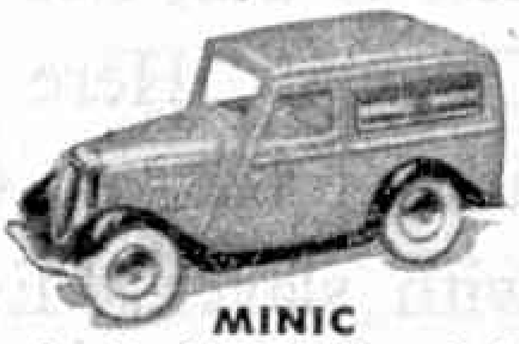

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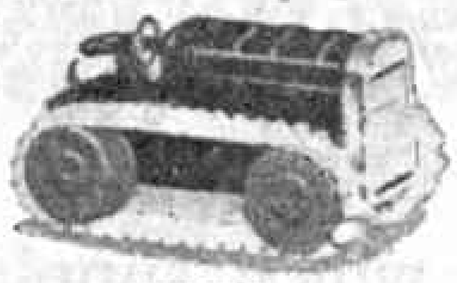

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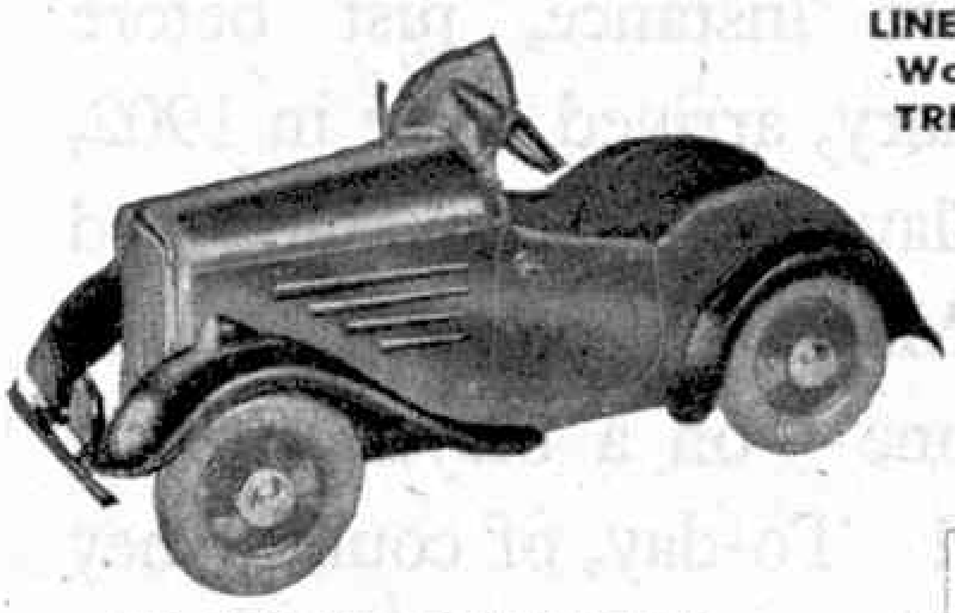

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ROUND THE WORLD WITH BSA No. 8

GOLD COAST

A town with a sinister reputation is Itu, not far from Calabar. Here on the beach, a market was held which supplied the New World with slaves. Even in the early years of this century human sacrifice and cannibalism were practised. For instance, just before Mary Slessor, the famous Missionary, arrived there in 1902, a chief had died; sixty of his slaves had been killed and eaten! When it was possible, Mary Slessor used to ride into the wilds of Africa—all alone—on a bicycle, to the great astonishment of the natives! To-day, of course, they know all about bicycles and are as anxious as you are to get a B.S.A. Unfortunately these famous machines are still scarce everywhere—but here is a tip for you. Ask your parents to have a word with your local dealer. If you are patient—your turn will come.

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Next Month: "DRIVING A DIESEL-ELECTRIC LOCOMOTIVE."

MECCANO MAGAZINE

Editorial Office:
Binns Road
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England

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No. 3
March 1945

With the Editor

B. O. A. Progress

Provisional figures issued by the British Overseas Airways Corporation covering its operations from January to December 1944, show a great expansion in every branch of its activities. The total miles flown by its aircraft during the year amounted to nearly 19,000,000, an increase of almost exactly 50 per cent. over the total miles flown in 1943. The number of passengers carried was approximately 101,000, an increase of more than 50 per cent.; cargo carried showed an increase of 69 per cent., and mail of over 51 per cent. Every day during the year B.O.A. aircraft flew an average distance of over 51,000 miles, the equivalent of more than twice round the world.

Since the war began the Corporation's aircraft have flown more than 57,000,000 miles.

Another Turbine Locomotive

It is interesting to note that there has recently been put in service on the Pennsylvania Railroad the first direct drive steam turbine locomotive ever to be constructed in the United States. This has been designed and built by the Baldwin Locomotive Works and the Westinghouse Electric and Manufacturing Company, in collaboration with the Pennsylvania Railroad. At the time of writing the new giant is undergoing tests to determine its adaptability to the operation of Pennsylvania long-distance high-speed passenger and freight services.

In incorporating direct drive from the forward or reverse turbine through the medium of reduction gears to the driving axle, the new Pennsylvania engine is similar to the L.M.S. "Turbomotive" No. 6202. This latter was the first of its kind to be constructed by a British railway, although trials had been made at various times with locomotives incorporating turbines, notably the Beyer-Peacock "Ljungström" turbine locomotive that made some trips on the L.M.S. in 1927. This, however, was a turbo-condensing unit, whereas L.M.S. No. 6202 and the new Pennsylvania engine have no condensing apparatus, the exhaust steam passing out of the chimney in the usual way. Both in fact can be regarded as normal locomotive designs in which the cylinders and reciprocating motion have been replaced by turbine drive.

The Pennsylvania engine is said to be one of the simplest to operate that have ever been built, in spite of the fact that it is designed to be sufficiently powerful to draw a full-length passenger train at 100 m.p.h. and high class freight trains at high speeds. Both forward and reverse movements at all speeds are controlled by a single lever actuating special pneumatic control apparatus.

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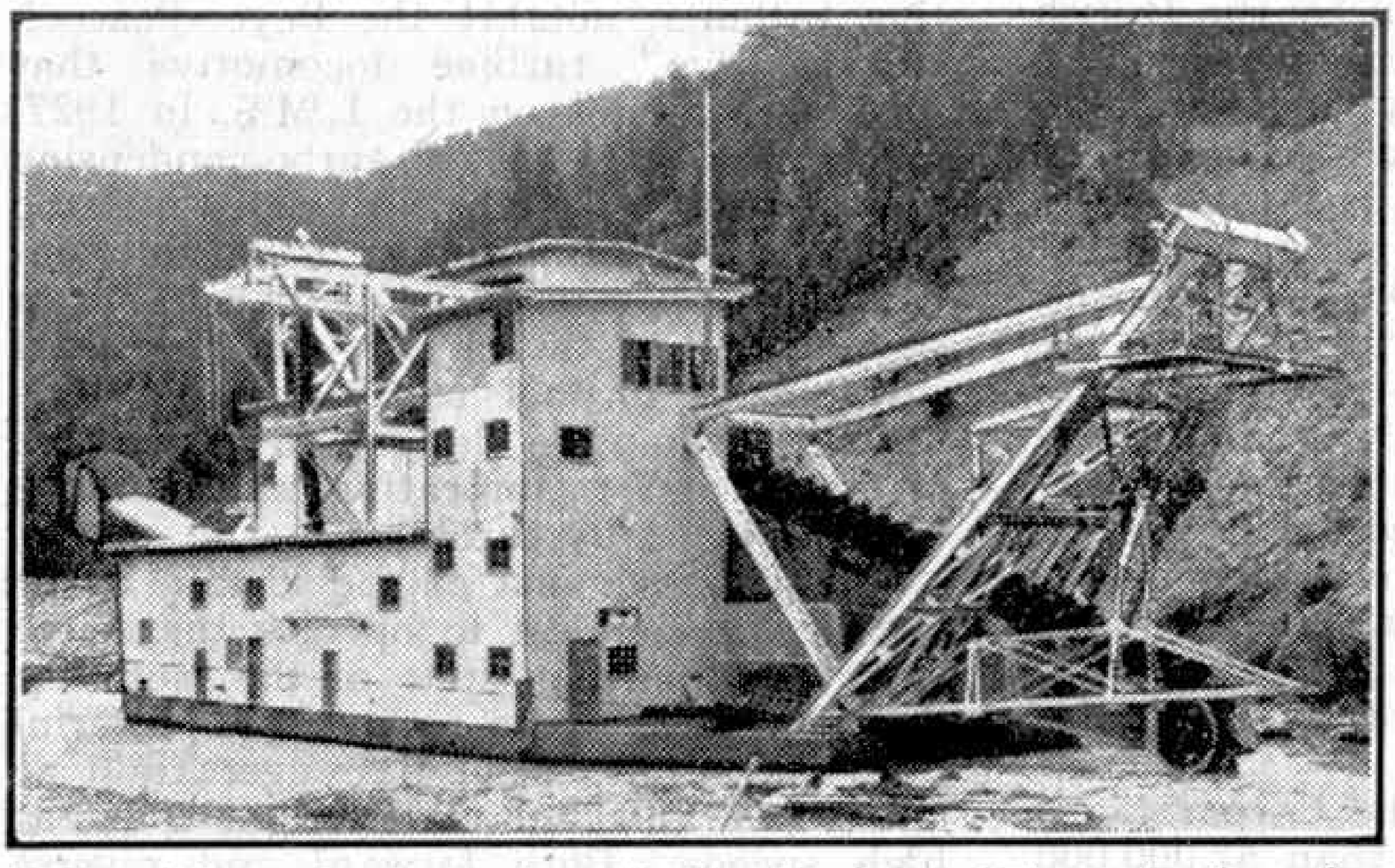
The Gold Dredge at Work

Mining Placer Deposits

IN the famous gold-producing regions of the United States and Canada the precious metal is found in river gravel, in what are known as placer deposits or placers. These gravels are the result of the disintegration or breaking up of quartz-bearing rocks under the action of rain and frost, the debris being carried away in the form of gravelly sand. The fine gold may be left also in the beds of dried-up rivers, and such deposits have produced great wealth in California,



A fine picture of a large placer dredge, showing typical construction. Our photographs are reproduced by courtesy of Ruston-Bucyrus Ltd., Lincoln, England.

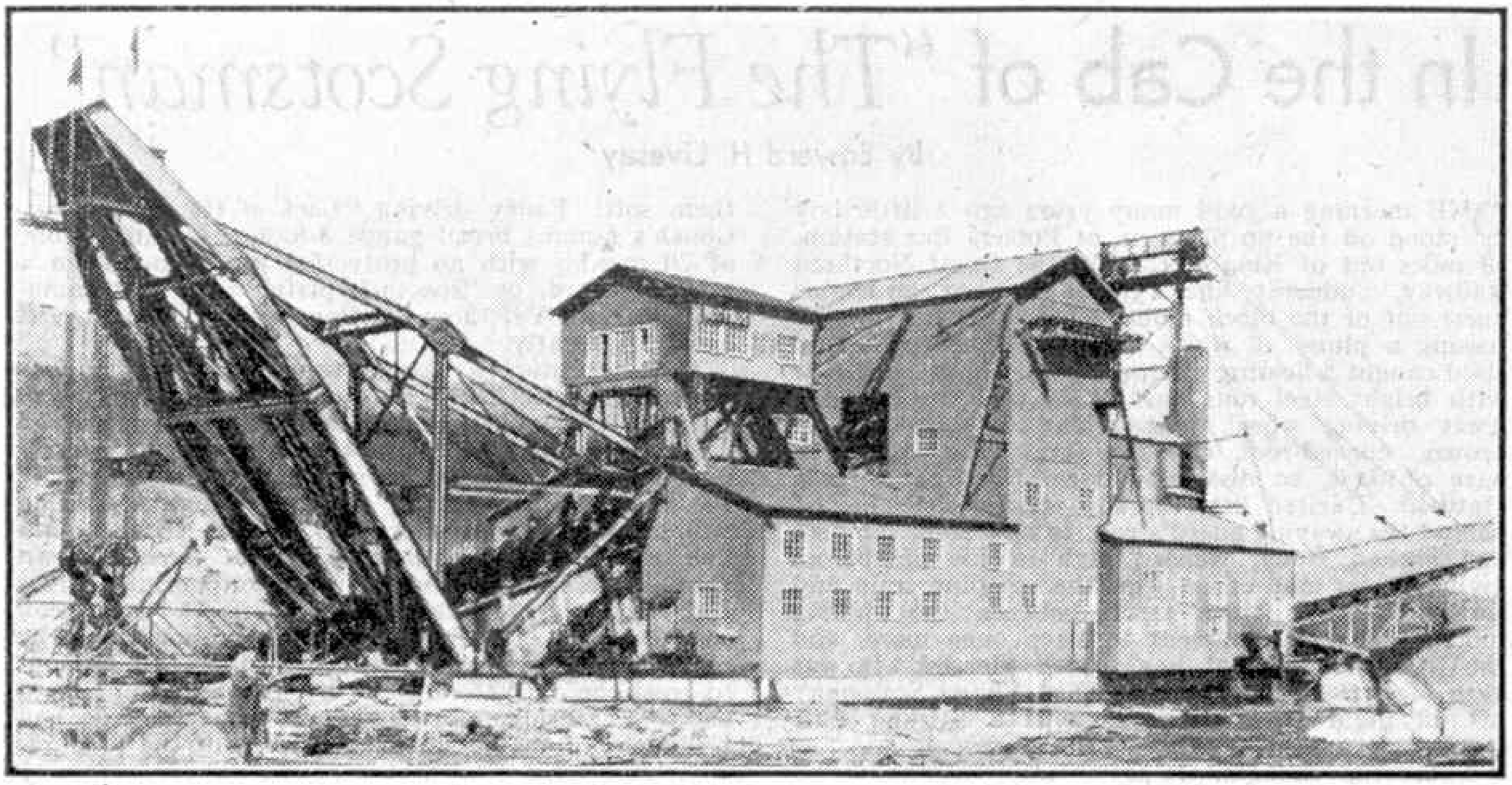
Australia and Siberia. Placer mining therefore is quite distinct from vein or reef mining in which the quartz-bearing rock has to be mined at great depths below the surface.

The early prospectors got their gold by "panning." In this process the gravel is shovelled into a sheet iron pan about 18 in. in diameter at the top and $10\frac{3}{4}$ in. at the bottom. The pan is filled up with water and the contents are swirled round so that the earthy matter is gradually eliminated until only a small residue remains, consisting of gold mixed with a small amount of sand. This residue is dried and the light sand is blown away, leaving only pure gold. Panning is a laborious process, and it was soon superseded by the "rocker," a sort of cradle about 3 ft. 6 in. long with a drawer having a perforated iron bottom. Earth is thrown into the drawer and flooded with water to get rid of lumps, and the cradle is then rocked until the finer material passes through the perforations in the drawer into a wooden tray underneath. This tray is fitted with cross bars, known as "riffles," which intercept the gold.

These processes were effective, but crude and slow. A great improvement was brought about by means of the "sluice," a wooden trough tapering slightly at its lower end, and fitted on the bottom with riffles to catch the gold. A constant and rapid flow of water is maintained through the sluice, into which the dirt is shovelled. Some of the riffles are charged with mercury, which forms an amalgam with the gold, and in this way the finest particles of gold are saved. Sometimes several troughs are fitted together end to end to form one long continuous sluice. The sluicing process is allowed to continue without interruption for some weeks, and then the gold and the amalgam are removed from the riffles. The gold in the amalgam is obtained by evaporating the mercury by the application of great heat.

When the surface deposits became exhausted, panning, rocking and sluicing became unprofitable, and to deal with the deeper placers the process of hydraulic mining or "hydraulicking" was introduced. This process makes use of jets of water at high pressure directed against a gravel bank so as to disintegrate the gravel. The high-pressure stream is obtained either by bringing water through pipes or troughs from some supply at a considerable height above the working level, or by means of powerful pumps. The debris of the banks is washed down to each sluice-box, where the gold is retained by riffles or by amalgamation as already described.

We now come to the most recent method of placer mining, in which enormous mechanical dredges are employed. A gold



A 17 cu. ft. placer gold dredge operating in Siberia.

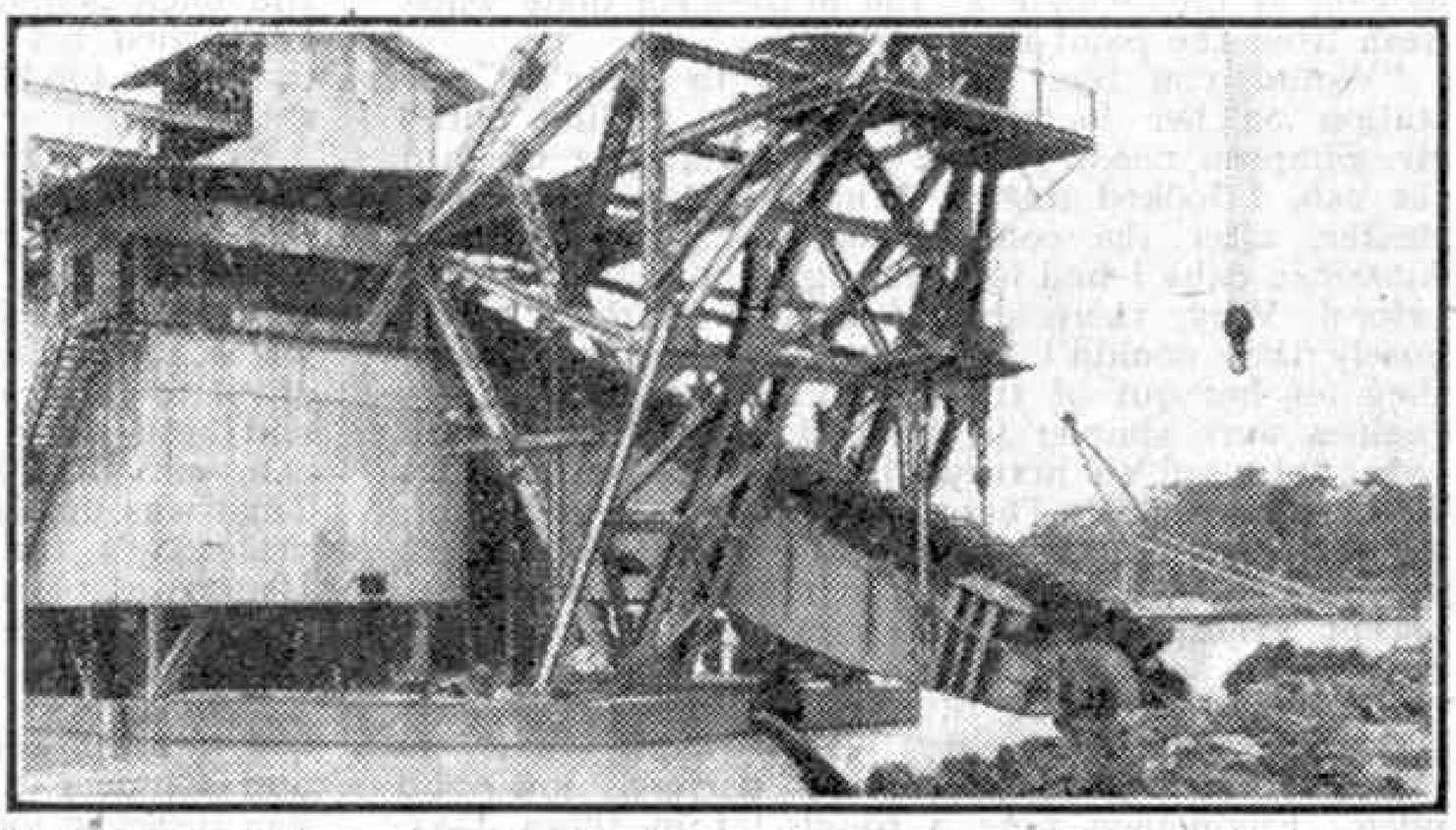
dredge is similar in operation to the bucket dredges that are so largely used for deepening and maintaining the channels of navigable waterways. The first successful dredge in North America for placer mining was built by the Bucyrus Company, which took its name from the town of Bucyrus in Ohio. This dredge was installed on Grasshopper Creek, Montana. As originally designed for electrical operation it was a continuous chain and link bucket type with a ladder length sufficient to dredge to a depth of 25 ft. The gravel was run through a trammel which rejected the large size rocks, the fines carrying the gold being dumped into a well and elevated by means of a secondary bucket elevator to a sluice box on the upper deck of the dredge.

The dredge started operations in 1895, but serious mechanical difficulties occurred immediately. It was redesigned and rebuilt during the winter of 1895–96, and as reconstructed it worked well. The success of this dredge revived the flagging spirits of placer miners and led to the creation of a great industry.

The main difference between a harbour or river dredge and a gold dredge is that the former deals mainly with soft mud, whereas the latter has to cope with gravel, stones and even fair-sized boulders. For this task the gold dredge is fitted with an endless chain of steel buckets travelling around tumbler rollers placed at each end of a steel box girder. The girder is pivoted on huge roller bearings so that it is able to rise and fall, the hoisting and lowering being carried out by a powerful winch type hoist. The Bucyrus-Erie dredges have buckets of from 4 to 20 cu. ft. capacity.

The gravel and mud scooped up by the buckets is discharged on reaching the top of the bucket arm and then passes through various de-watering and concentrating devices to a mercury amalgamator, in which the gold is recovered by amalgamation with the mercury. Finally the pure gold is obtained by heat.

Our cover picture of a huge gold dredge is reproduced from a photograph kindly supplied by Ruston-Bucyrus Ltd., Lincoln.



This picture shows how the buckets of a dredge cut into and scoop up the deposit.

In the Cab of "*The Flying Scotsman*"

By Edward H. Livesay

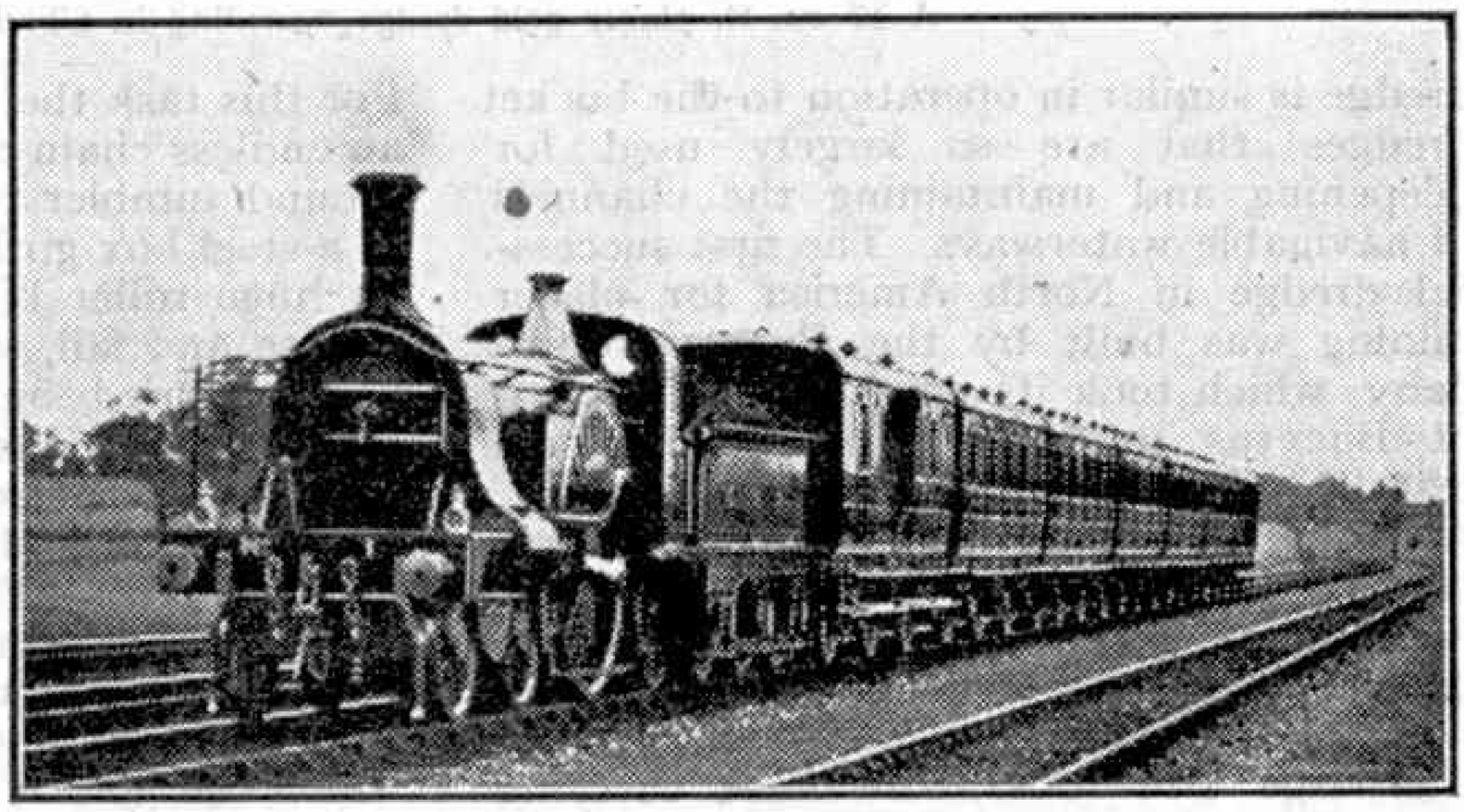
ONE morning a good many years ago a little boy stood on the up platform of Potters Bar station, 13 miles out of King's Cross on the Great Northern Railway. Suddenly, like a Jack-in-the-box, an engine burst out of the black mouth of Potters Bar tunnel, tossing a plume of white above it. The spellbound child caught a fleeting glimpse of a sleek, green engine with bright steel rods flashing to and fro beside a great driving wheel, and behind, a cavalcade of brown, curved-roof carriages streaming by in a haze of dust, to disappear down the line towards Hatfield. Excited litter sprang up from the ballast behind the swaying guard's van, to be tossed, tumbled and sucked along, whirled high in the air before giving up its mad chase after the speeding train and settling wearily down again between the shining metals. The station went to sleep once more, and the little boy trotted home, well pleased. It was 17th May 1895; he had seen "*The Flying Scotsman*" in full flight to Edinburgh, with a Stirling 8-ft. single at its head.

The scene changes. It is no longer Potters Bar station in the nineties, but King's Cross locomotive shed on 24th August 1938. The little boy is as fond of locomotives as ever, and has come to the shed to make close acquaintance with L.N.E.R. streamlined "A4s," on one of which he will be riding to Edinburgh next day with "*The Flying Scotsman*."

As you will have guessed, I was that little boy, and when going through the shed with Mr. Simpson, the Assistant Superintendent, looking at "A4s" and "Atlantics" being groomed and lit-up, he said "There's an engine outside you might like to see—'Old No. 1,' a Stirling single. She's been brought out of the Locomotive Museum at York and put into running order, and is taking an excursion train to Cambridge this morning." And there she stood, with the sunlight glinting on her glossy paint and polished brass, a picture in green and gold, looking as immaculate as she must have done when fresh from the paint-shop in 1870.

"Would you like to go round to King's Cross station on her footplate—she's just pulling out?" Mr. Simpson needn't have asked! Climbing up into the cab, I looked round. What a bleak, bare little shelter, after the comfort and complexity of the American cabs I had been riding in only a few weeks before! Why, there seemed hardly anything there! Surely they couldn't have put everything back when they let her out of the Museum? But they had—engines were simpler in those days, and enginemen were not used to luxury; and controls and fittings were simpler too. There was a pull-out regulator, a reverse lever, brake valve, water and steam gauges, injector, whistle and blower handles, but little else, except sanding and damper handles. There were two tip-up seats, or shelves rather; a modern concession, certainly not fitted when the engine first appeared. The cab was little more than an exaggerated weather-board, so narrow, low and open. Enginemen were a tough lot in those days. Many claimed they didn't like cabs—they made them soft! Fancy driving "*Lord of the Isles*," say, Gooch's famous broad gauge 8-footer, in mid-winter, at 70 m.p.h., with no protection at all, not even a weather-board, or "spectacle-plate" as it was sometimes called. Yet those old-timers did it, and thrived on it apparently.

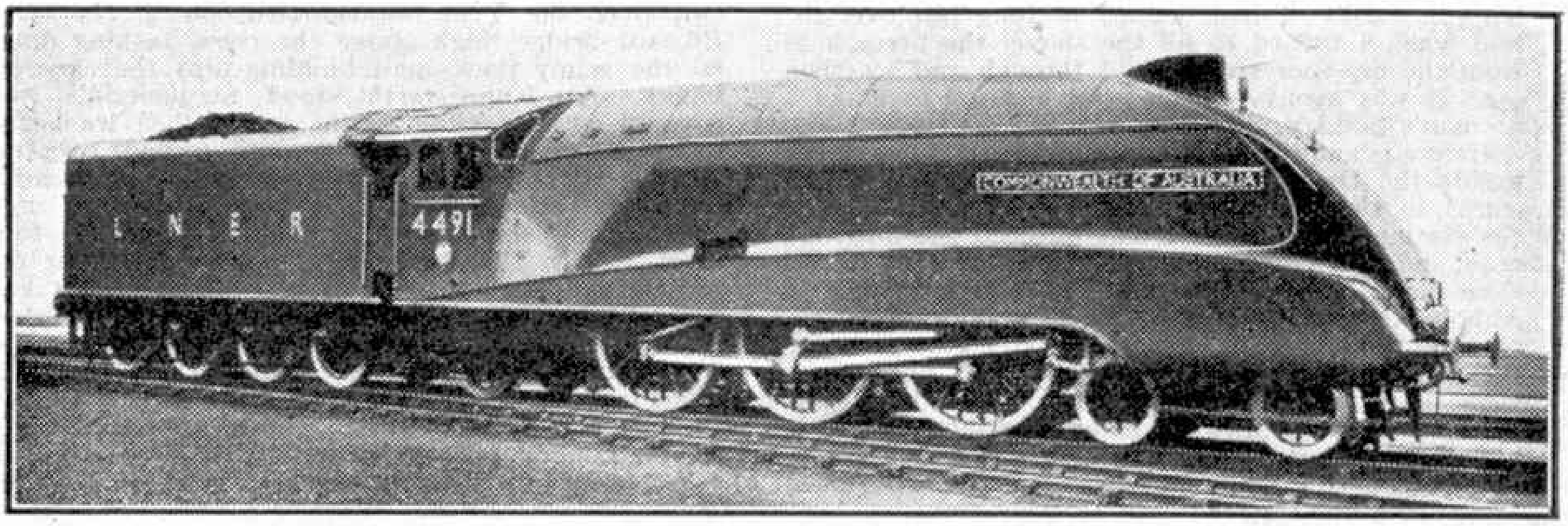
The last touches having been given to her immaculate perfection, No. 1 came to life, and with cylinder cocks squirting steam and water moved off with stately gait out of the Yard, with the crew plus an Inspector and myself on the footplate. It was fascinating actually to be riding a Stirling 8-footer after all these years! Out on to the main line near Belle Isle Box, we then backed down through smoky Gasworks Tunnel into King's Cross and on to the waiting train of "period" brown teak coaches, also resurrected for the occasion. The platform was crowded with enthusiasts, all anxious to greet the old veteran, and if possible travel behind her to Cambridge. I would have done this too had I thought of the excursion in time, but the preparations for the "*Flying Scotsman*" run had put the affair clean out of my mind, and every seat was booked. However, the little trip on her footplate had been a greater treat and privilege than Cambridge and back behind her, so after taking a snap or two I watched her pull out, to add a few more miles to the 1,400,000 already chalked up during her active life.



"The Flying Scotsman" of 1888, put in order for special half-day trips in 1938. The engine is G.N.R. 4-2-2 No. 1, the famous Stirling single-wheeler. Photograph by courtesy of the L.N.E.R.

Next day the "*Flying Scotsman*" trip brought me back to the shed again to pick up No. 4491, "*Commonwealth of Australia*." First came introductions to her two crews; one English, Taylor and Floyd, and the other Scottish, Maguire and Kinnear, after which I stood aside to watch the final touches being given to lubricators, fire and so on—coal and water had been taken on already. Floyd was busy in the cab, and Taylor, with an oil-can, on the ground. Time was up, so we piled into the cab and followed yesterday's trail round into King's Cross, No. 10 Departure platform, finding the usual little crowd of well-wishers gathered to watch "*The Flying Scotsman*" off on her 392-mile non-stop run to Edinburgh.

9.45 a.m., and 15 minutes to train time. Maguire and Kinnear retired to the compartment next the van reserved for the off-duty crew; I took a snapshot and put a few queries to Taylor before settling down

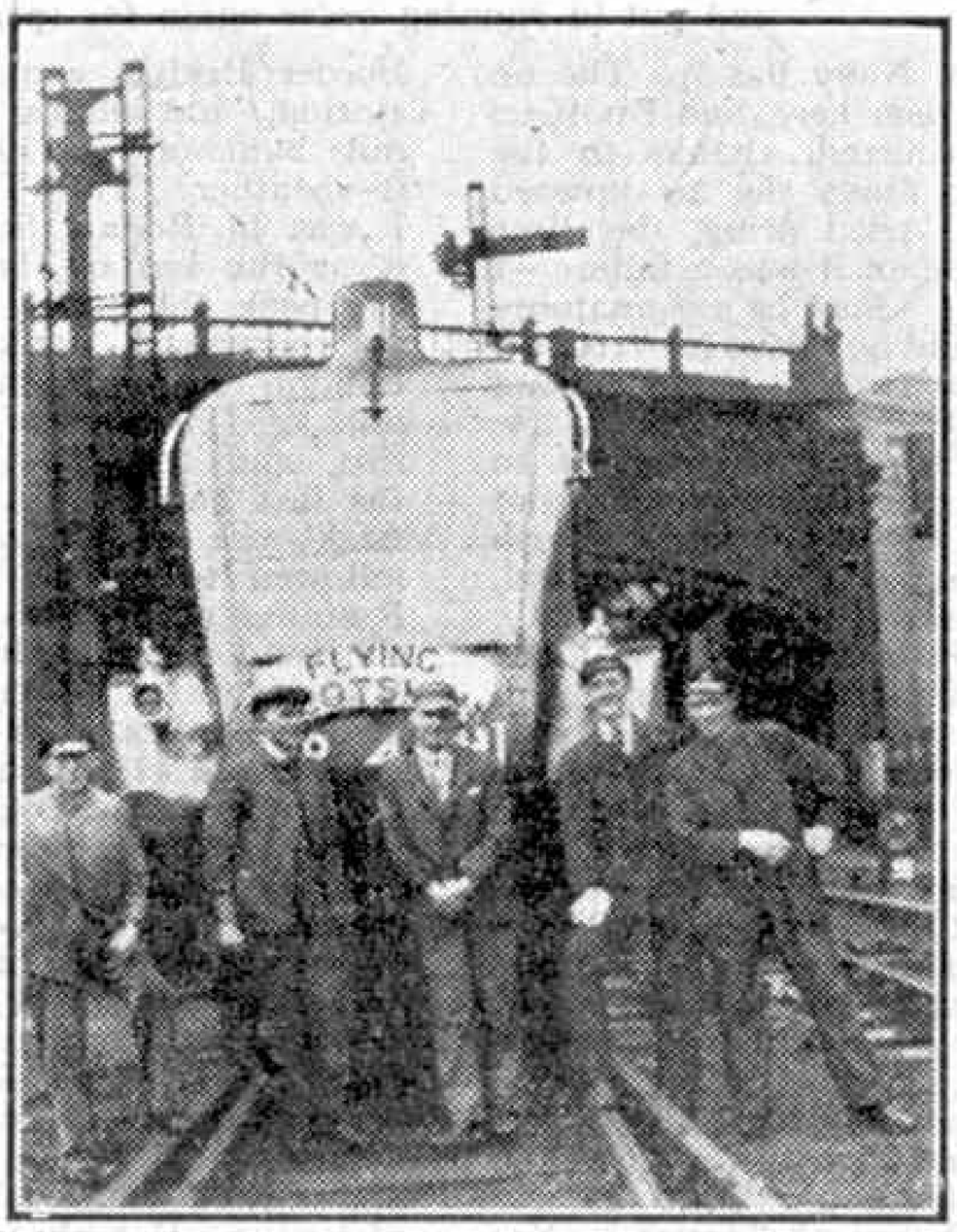


L.N.E.R. "Commonwealth of Australia," the locomotive on which the footplate trip described in this article was made. Photograph by courtesy of the L.N.E.R.

in Floyd's bucket seat, which he said he wouldn't be wanting for a while. I felt quite a thrill of anticipation at the treat in store for me that sunny summer day. Floyd, watching from the cab door, caught the wave of the Guard's green flag, and with a laconic "Right away!" turned inboard and busied himself with injector and shovel. Taylor reached forward, pulled the regulator, and with cylinder cocks viciously hissing, on the stroke of 10 a.m. "*Commonwealth of Australia*" moved away from the platform into the sooty mouth of Gasworks Tunnel with her 500-ton load behind her and 392 non-stop miles in front of her.

Picking up speed rapidly, in spite of a brief slip on the 1 in 107 gradient in the tunnel, quickly checked with sand, we ran through Hornsey, four miles from the start, at rising 50 according to the Flaman speed recorder tucked away under my seat. The acceleration continued up the long 13-mile bank, through tunnel after tunnel —seven in that distance— until we roared through Potters Bar and over the the top at 60. My childhood treat in reverse! *Then* I had watched "*The Flying Scotsman*" from the platform—*now* I saw the blurred station buildings stream by from the cab. Was there a little boy standing there, or was it only my memory playing tricks?

Down through Hatfield we rushed, and out on to the many-arched Welwyn viaduct, shortly afterwards picking up water from Langley troughs, the first of six refreshers taken en route. Very simple. Floyd stood ready at the handle, and at a hail from Taylor that we were over the trough, round it whirled, down went the scoop, and in a matter of seconds a thousand gallons or so were up in the tank.



On the completion of the trip, at Waverley, Edinburgh. From left to right the figures are Taylor, Maguire, the author, Floyd and Kinnear.

By this time I had become used to my surroundings, differing somewhat as they did from those on the North American engines with which I was most familiar. The cab was very well arranged and free from draught and heat, save right in front of the firedoor, which was generally kept open, rather to my surprise. Though the cab was less roomy than those across the Atlantic—the British loading-gauge is 9 ft. by 13 ft. 3 in. as against 10 ft. 6 in. by 15 ft. 6 in.—it was in no way cramped, and the bucket seat was very comfortable. The engine's riding was admirable, and the balance of the 3-cylinder 120-deg. drive so good that the motion was imperceptible.

I was thoroughly enjoying the novelty of spinning along over perfect British track when we swept through Stevenage, and began the long descent to Sandy. Floyd shouted in my ear: "We'll be going pretty fast soon—watch the Flaman!" Bending down, I saw the hand was moving steadily across the dial, and I could feel the beautiful engine accelerating. From its action it was enjoying things as much as I was. Like a race-horse extending itself in a swinging gallop over springy turf, No. 4491 was doing just what she was intended to do—she was showing her heels, and speed was rising steadily—70–80–90, and we roared through Arlesey with a crash of sound flung back from the station buildings and footbridge as it flicked overhead. Sitting snug in Floyd's seat, looking ahead through the strip of safety glass by the open window or down at the ballast streaming by beneath, I felt a glow spread through me, and I gloried in the song of the wind as it swept past.

Floyd's job was much easier than I had thought it would be. Instead of the firing being of the "little and often" kind, it seemed more the "good deal and seldom"; 20 or 30 shovelfuls would be followed by a 10-minute rest. Most fuel was placed at the back of the box, to shake down towards the front, and as this method seemed quite simple I pleaded permission to try my hand at firing, which was readily granted; he passed the shovel to me with a smile. I wanted to be able to say I had fired "*The Flying Scotsman*"! I had fired on threshing-engines on the prairie, in the stokehole of the cruiser "*Rainbow*" during the First War, and in minesweeping trawlers too, and "*Commonwealth of Australia*" would be another scalp at my belt. But it proved a painful business, and after one or two essays I gave it up. Thinking the cab was going to be

hot—it wasn't—I had donned nothing but overalls, and when I turned to fill the shovel the fierce heat from the fire-door struck right through and scorched me. It was agony—I was being roasted to make a fireman's holiday.

Here was another familiar stretch—the embankment beside the Ouse, nearing Huntingdon, where I had learnt to swim long years ago. We roared through the station, from which I had watched the 8-footers nose and lurch over the points outside just as we were doing, and go flying up the 1 in 200 bank to Abbots Ripton. An easy bit for some miles followed, through Peterborough and over Werrington troughs, these making a second contribution to our water-tank, and shortly after the long Stoke bank was reached, down which so many spectacular speeds have been recorded, including "*Mallard's*" 126 m.p.h. Over the top at Stoke Box, and it was down, down almost continuously for over 20 miles through Grantham and Newark to Muskham troughs.

After a cautious negotiation of York's curved station the "change of watch" took place, near Tollerton, 198 miles from London. Maguire and Kinnear, now in working rig, came on to the footplate, and after exchanging a few casual remarks on conditions with Taylor and Floyd, the latter pair retired to the compartment reserved for enginemen off-duty, "to clean, dinner and get their heads down," as the Navy has it. The up "*Flying Scotsman*" flashed by near here, and I noticed how little air disturbance occurred, thanks to the streamlining, which evidently flings the air upward more than sideways. Again I tried firing, this time under Kinnear's tuition, but again it was a failure—I could not stand that roasting. Part of my anatomy was already nicely browned; I did not want it overdone.

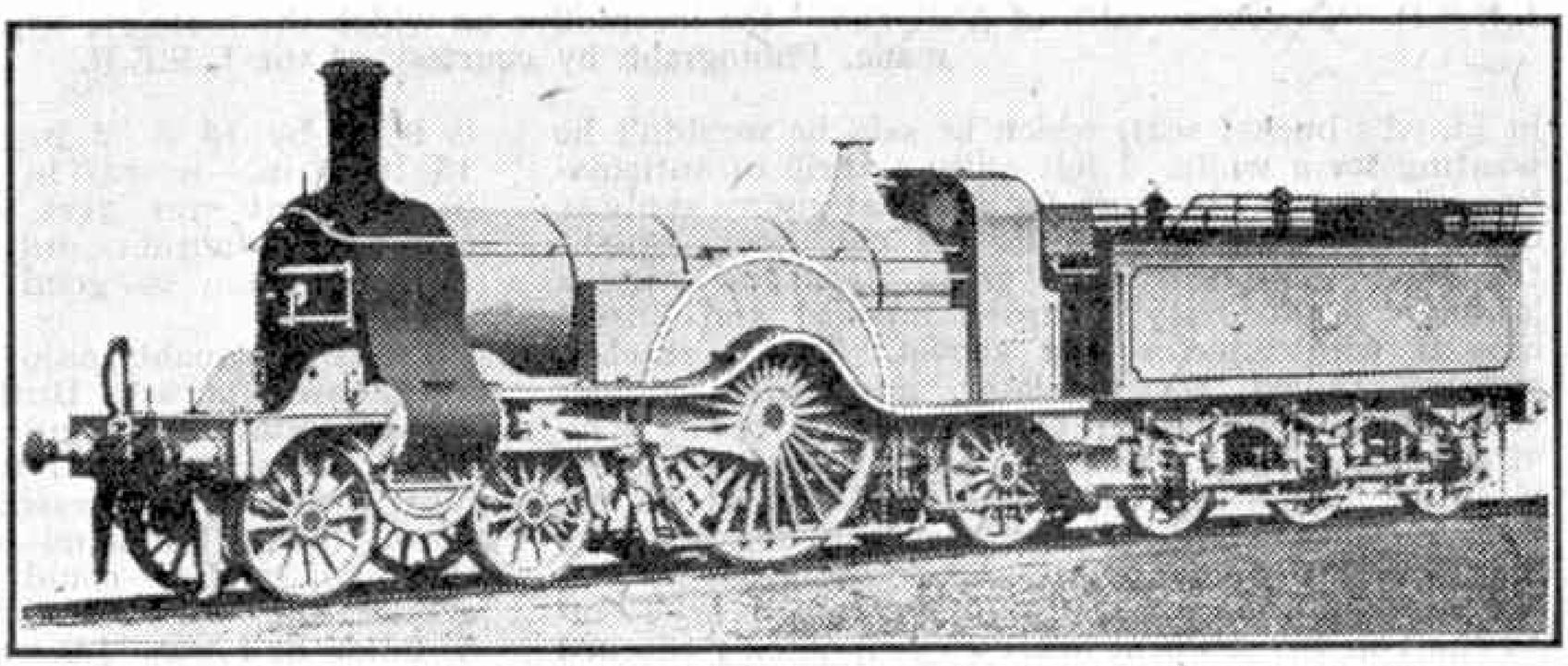
Hour after hour "*Commonwealth*" jogged along at 65–70 m.p.h.; it was all the schedule called for. For 100 miles or so right from Retford nearly to Durham the profile is extraordinarily easy, and she made light of her job. Past Darlington, with Stephenson's "*Locomotion No. 1*" on her pedestal, the first engine to haul passengers on a railway; on to Durham, with its glorious Cathedral and Castle dominating the city, the fascinating run continued; fascinating not only from a locomotive enthusiast's viewpoint, but also from a scenic angle. There was nearly always something of interest to note both inside and outside the cab, and I enjoyed every moment. The tender-corridor came in very useful, being used several times to break any possible monotony of a seven-hour non-stop run.

Little has been said about speed, regulator, cut-off, and so on; there is no need to give a log as alterations were so seldom made to the controls. The regulator was kept wide open, and the cut-off generally left at 15 per cent. only lengthened slightly up gradients. The load was only moderate for an "A4," as was the average speed. I should say that even a less experienced driver would get all that was called or out of No. 4491. She was just playing with her job, spinning along tirelessly, effortlessly, up hill, down dale and on the level, no doubt right on schedule or a trifle ahead of it. I don't think we were checked by signals once.

Closing on Newcastle, the route became more and more tricky. "*The Flying Scotsman*" snaked round curve after curve, clicking over a maze of points, crossings and junctions. Not a high speed stretch, this, which is why the "*Silver Jubilee*" does most of its spectacular running south of Darlington. Out over the Tyne we rumbled, on to the King Edward bridge, high above the river, looking down on the grimy docks and building-slips that line its banks. At Killingworth stood Stephenson's ivy-covered cottage, close to the track; then we began to run out of smoke and grime into unspoilt country, and the farther north we went the lovelier it became. Gradients stiffened, though they see-sawed and were mostly short, until at Alnmouth we hit four miles of 1 in 170, and I saw Maguire reach for the reverse handle. The exhaust note deepened; it had generally been practically inaudible. Falloden flashed by, with a level crossing and a "Halt," where the Grey family have—or had, at any rate—the right to "Flag" any train they want to catch. Lucker trough gave No. 4491 another drink, the sixth since leaving London, and she sped on like a giant refreshed.

We swept out on to the many-arched granite Royal Border Bridge, across the Tweed, through Berwick station, and almost at once struck another four-mile bank of 1 in 190. I sniffed the air. What was it—heather? Yes! There was the boundary board—I was in Bonnie Scotland at last! Grant's House is at the top of the long pull from Berwick; over the peak there is a four mile drop at 1 in 98, the Cockburnspath bank, the stiffest gradient between London and Edinburgh with the exception of a mile of 1 in 78 up into Waverley. Speeding down this, and through the little tunnel near the top—the last had been Askham, near Retford, 219 miles back—the coast came into sight again, and was followed to Dunbar, where the lines turn inland. Running on into Edinburgh, with the fire burning thin and pressure dropping, we came to a stand in Waverley at 4.57 p.m. three minutes ahead of time. The 392 miles from King's Cross had been covered non-stop in 417 minutes, at an average of 56.2 m.p.h.

Returning to London next day, with the same engine and the same crews, the run was just as pleasant and uneventful. Taylor almost promised some real speed down Stoke bank, but on getting there we were a little ahead of time, so nothing spectacular was possible. "*The Flying Scotsman's*" non-stop reputation has to be upheld at all costs; even as it was, we found distant signals against us once or twice south of Hatfield; brakes would begin gently rubbing and the warning arms were approached cautiously, with everyone apprehensive of a stop. But always they would drop just in time to prevent this disaster, off would go the brakes, and the exhaust would begin streaming over our heads again. "*Commonwealth of Australia*" came to rest in King's Cross at 4.55, five minutes early; I went round to the shed with her, to be greeted with laughter in the Superintendent's office: "You look as if you've been working!" "So I have—that's why we got in five minutes ahead of time!" "Well, there's lots of hot water. What did you think of it all?" "Splendid—couldn't have been better!" Verily, that was the only possible judgment to pass on this, my first run on a British express locomotive.



The former G.N.R. 4-2-2 No. 1, the famous single-wheeler preserved in York Museum and put in running order again for special purposes in 1938.

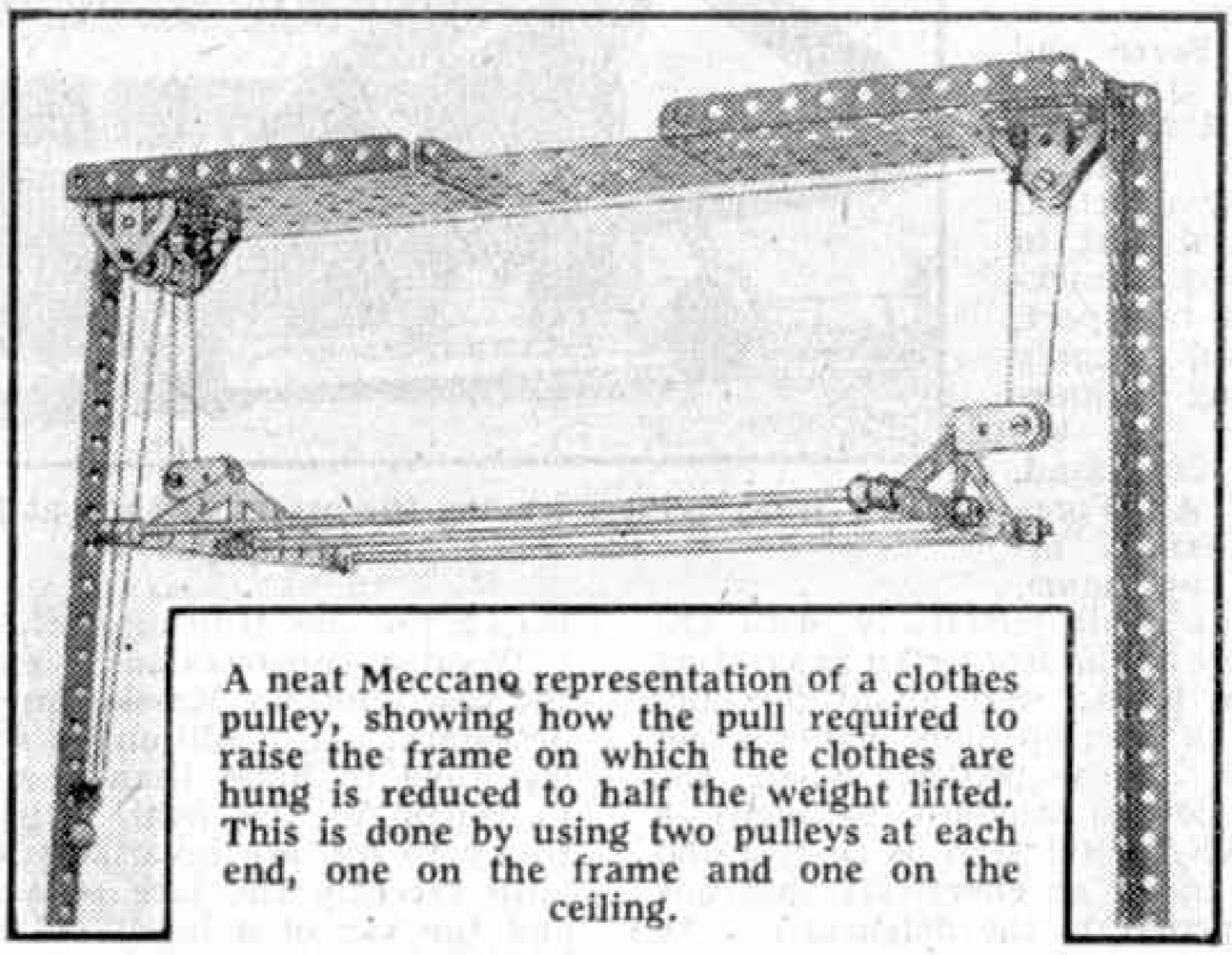
Have You Ever Thought About This?

How Do Cranes Lift Huge Weights?

CRANES are among the things that we all take for granted until one day perhaps we realise with what apparently little effort a crane will raise a huge weight, in some instances one that seems to be nearly equal to its own, or even greater. We notice their power first when we see or read of great floating cranes, such as the "*Mammoth*" and others described in the "*M.M.*," which can lift entire steel bridges in the air. The bridges referred to of course are not the size of Sydney Harbour Bridge, or the Forth Bridge, but they are big enough to make one wonder. The explanation of the power of cranes that first springs to the mind when one does think about the problem is that the crane has a powerful steam engine or electric motor. This does help of course, but cranes operated by a man turning a handle like that of a mangling machine, can raise incredibly heavy weights, too, so that there is more in it than that.

THE WRONG WAY—AND THE RIGHT

Actually the solution is a very simple one, of which many interesting illustrations can be found. One of the best is the clothes-drying rack that is seen in kitchens, suspended from the ceiling. Some of these take quite a lot of hoisting, especially when they are full of wet clothes! Others go up very easily, and usually the explanation is that the latter have been put up by somebody who really understands what is wanted. Those that are difficult to hoist have ropes that pass over pulleys screwed to the ceiling joists and are fastened directly to the framework that is pulled up and down. This means that the full weight is carried by two ropes, one at each end, and it is this weight against which the unfortunate owner of the contrivance has to pull.



A neat Meccano representation of a clothes pulley, showing how the pull required to raise the frame on which the clothes are hung is reduced to half the weight lifted. This is done by using two pulleys at each end, one on the frame and one on the ceiling.

Now see what a little thought can do! Suppose that instead of being attached direct to the framework the ropes are passed round pulleys on this and carried up again to the ceiling to have their ends fixed there. Now the load or weight is distributed at each end over two supporting ropes instead of one, and thus the pull on each rope is halved. It is against the pull or tension of the rope that the user of the device has to exert his strength. Clearly the tension is the same all along the length of each rope, since in reality what we have called the supporting ropes are only parts of the one length. Thus to raise the framework a pull of only half the total weight is needed.

GIVING PLENTY OF ROPE

There is nothing like making life easy, and the scientist and the engineer can do much to get rid of hard work for us. The force required could be reduced further by passing the ropes over more pulleys, on the ceiling and on the framework, before fixing their ends. Every time a pulley or rope is added there is a reduction. With four pulleys at each end, two at the ceiling and two at the frame, the force called for is only a quarter of the load, with six it is only a sixth, and so on; if plenty of pulleys were used a baby could hoist the heaviest week's wash without difficulty!

But there is a snag about piling up clusters of ropes and pulleys in this way. When two pulleys are used at each end, one at the top and one at the bottom, the ropes have to be pulled through twice the height by which the framework is raised. The distance is multiplied again every time a pulley is added. Suppose six pulleys altogether were used, then the ropes would have to be pulled three times the actual distance through which the framework is raised. This would require quite a lot of rope. In fact there would be enough loose rope lying about during hoisting to entangle every member of the family, so most people are content with four pulleys.

Now cranes work on exactly the same principle. The rope or wire cable from the hoisting drum does not simply pass over a pulley at the head of a jib, but passes round two or three pulleys there and a corresponding number in a block to which the lifting hook is attached. Suppose that there are six ropes or cables running up and down between two blocks. Then, if a weight of one ton is being lifted, the actual pull on each rope will be one sixth of a ton, that is only a little more than 370 lb., leaving friction out of account, and so a smaller motor or steam engine can be used than would otherwise be necessary.

SLOW PERHAPS, BUT SURE

Both small cranes turned by hand and enormous cranes such as the 500-ton giant floating crane "*Mammoth*" work according to this plan, the actual pull on the rope or cable of the hoisting system being reduced considerably below the weight to be raised by passing it round pulleys at the jib head, and on the lifting block. There is one restriction, of which a hint has already been given. The greater the number of pulleys the farther the rope has to travel, and of course the more cable is required. Engineers have no difficulty in packing away the cable used, however many pulleys there are, and they leave nothing about for the cranemen to trip over. But they always have in mind that the load is raised at a rate much slower than that at which the rope is wound round the drum. In other words to use a phrase that engineers often apply, what is gained in power is lost in speed. This does not matter much in the case of a crane, the chief purpose of which is to do the lifting. The speed at which it lifts usually is a point of secondary importance.

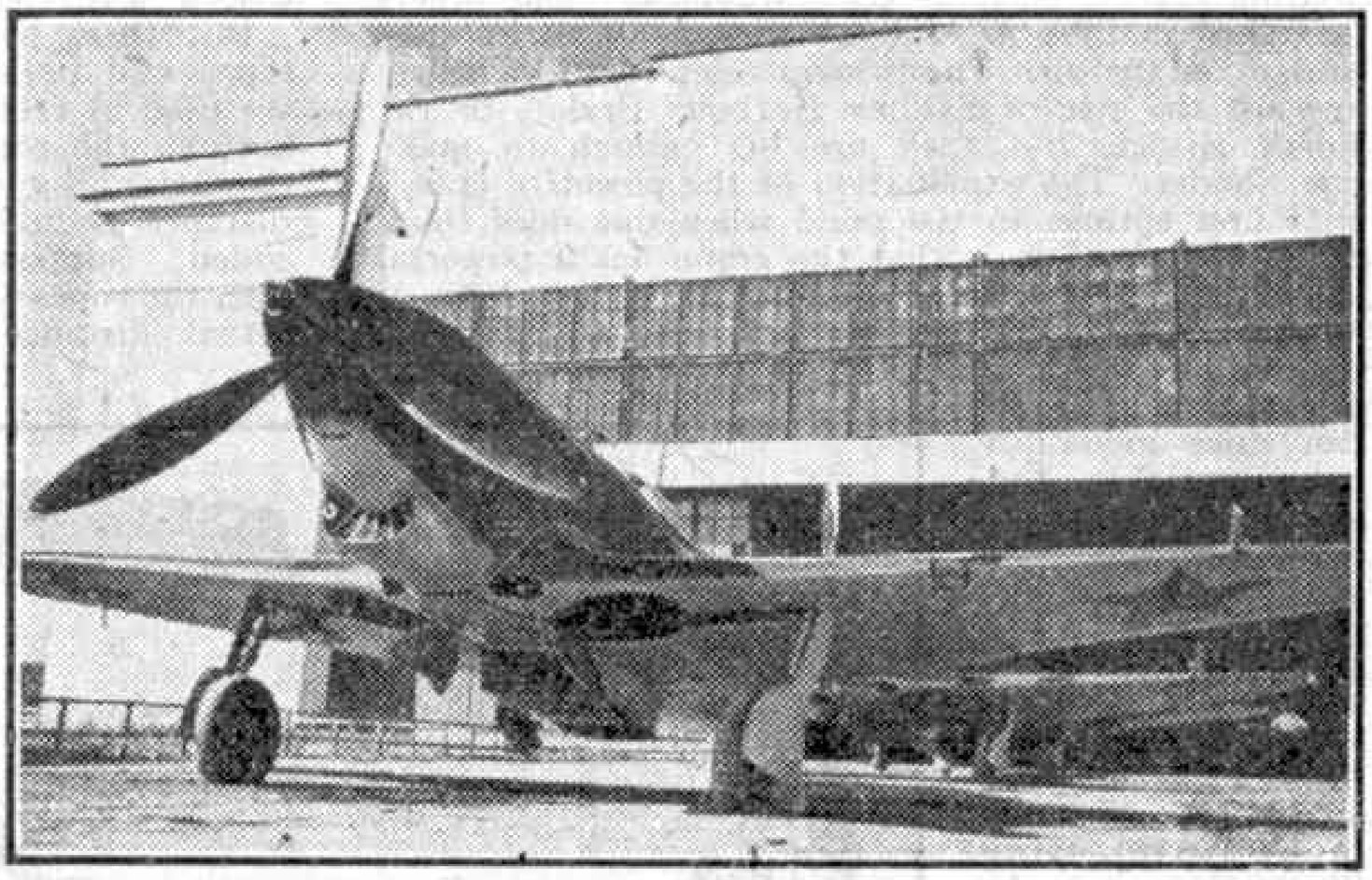
Fighters of the Red Air Force

By John W. R. Taylor

THE Red Air Force has always been shrouded by the Russians beneath a veil of secrecy, and consequently few details of its equipment have been published in the aeronautical press. But the results achieved in more than four years of war against the Luftwaffe have proved that this secrecy is not designed to hide faults. On the contrary, it has enabled the Russians to spring surprise after surprise on the Hun, with the result that the Luftwaffe has never known what to expect next.

Before going into a detailed study of recent Red Air Force fighter aircraft it is well to recall a few of the more important considerations that govern the design and performance of these machines. The big difference between the Red Air Force and "the other R.A.F." is that the Russians do not regard their air force as a separate offensive weapon. It is essentially a tactical force, striking hard and fast in support of the Red Army, attacking enemy troops and transport, bombing airfields and supply lines, but never waging a long-term strategic policy in the manner of our Bomber Command. Thus, while the Royal Air Force has been crippling German industry and transport at home, the Red Air Force has dealt effectively with the products of that industry at the front. An interesting fact is that Britain and Russia were about the only countries in the world to develop night fighters and night fighting tactics. Consequently, when the Luftwaffe attacked Moscow in strength, by night as well as by day, the YAK-1s and MIG-3s co-operated with the anti-aircraft gunners so effectively that few bombers were able to penetrate the defences of the capital.

Production naturally suffered when the factories were transferred lock, stock and barrel to behind the Ural Mountains during the German advance of 1941-2. But designers and workers alike have put their backs into the job of turning out as many aircraft as possible since then, and output has reached incredible proportions. The exact production figure is not known, but is thought to be about three times that of the German aircraft industry. Quantity has not been achieved at the expense of quality, however, and Russian fighters have developed technically to an amazing degree in the past four years. The latest—the LAGG-5—is very good indeed, and a match for any Hun aircraft.



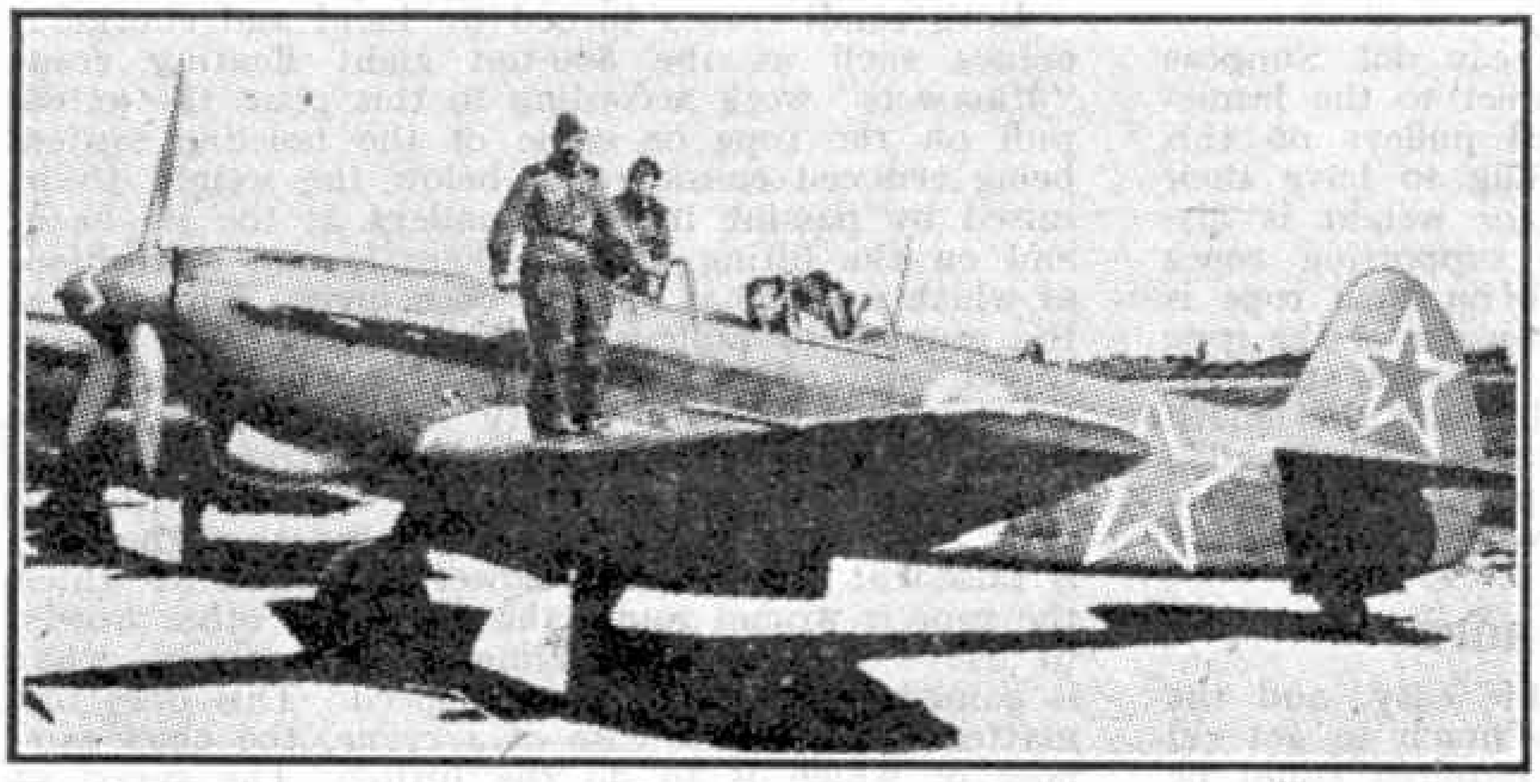
YAK (I-26) fighters leaving the assembly shop at the Soviet "X" aircraft factory.

Wooden construction is employed extensively, as the vast forests of Russia can provide all the materials necessary. In addition a wooden aeroplane takes less time to build than a metal one, and is easier to repair in the field. Russian fighters, although tricky to fly, are invariably very manœuvrable; but until recently the lack of a really powerful engine, and the use of a lower octane fuel than that used by Britain or Germany, have prevented any spectacular performance figures.

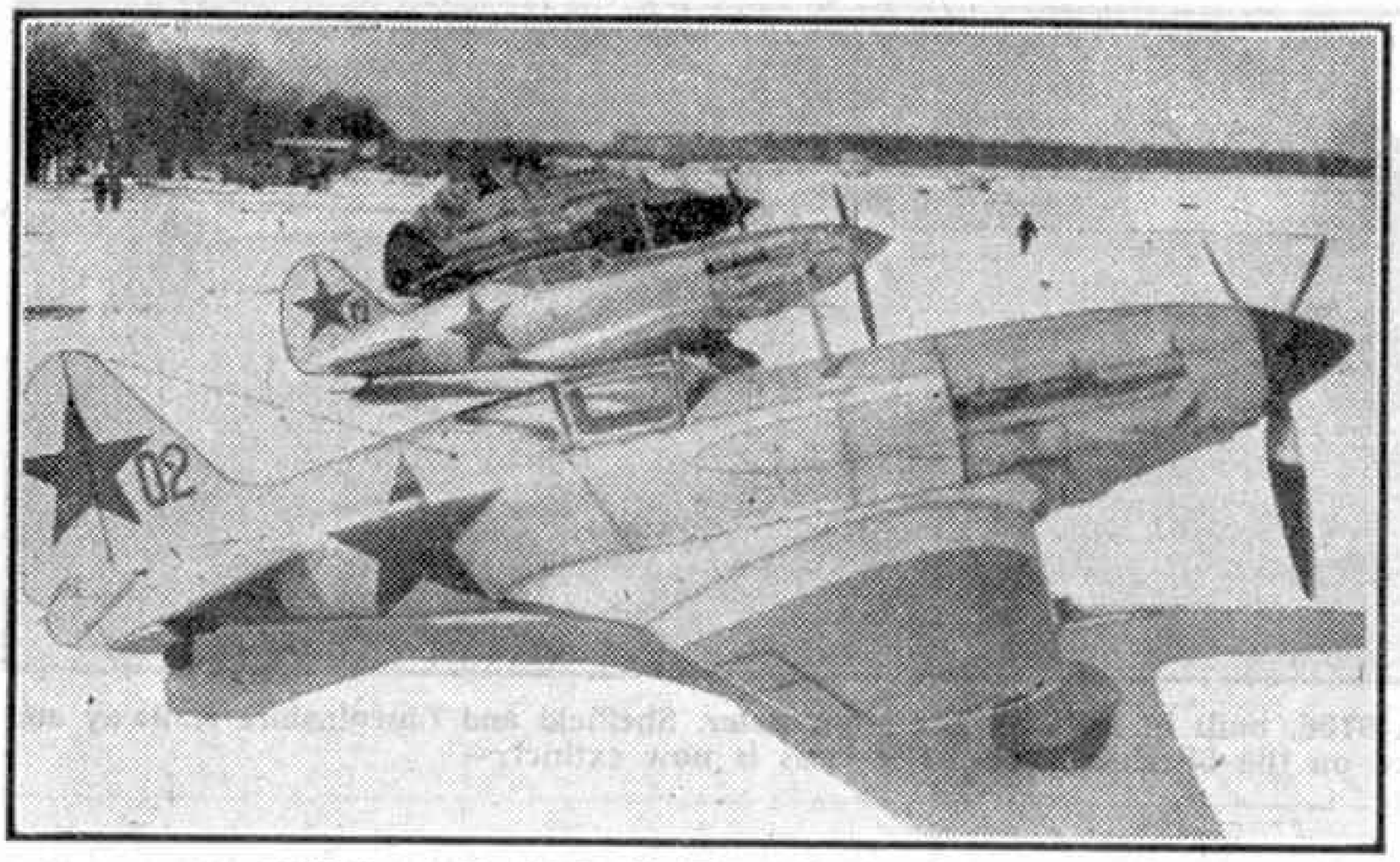
When Germany invaded Russia on 22nd June, 1941, the Luftwaffe expected to be matched against obsolete biplanes of the I-15 "Chato" type and squat I-16 "Rata" monoplanes, similar to those used in the Spanish Civil War. Instead the Hun found his Messerschmitts faced by a new series of fast, manœuvrable low wing monoplane fighters of advanced design, flown by pilots who knew how to get every ounce out of their machines.

The first of these was the I-17, a neat little fighter powered by an 860 h.p. M-100 (Hispano Suiza) engine, and armed with a high-velocity 20 mm. cannon firing through the airscrew hub and four wing-mounted machine-guns. Designed by N. N. Polikarpov, the I-17 was all-metal and had a top speed of 300 m.p.h. An unusual feature was the use of a retractable radiator under each wing, made possible by the use of a new engine coolant discovered by the Red Air Force's technicians.

Just two months after the invasion of Russia, No. 151 Wing of the Royal Air Force,



The YAK-9 fighter, shown here, has a top speed of about 390 m.p.h., and is the fastest Russian warplane.



MIG-3s of the Red Air Force in a wintry setting.

equipped with "Hurricanes," arrived at Murmansk. The "Hurri" soon made a tremendous hit with the Russians because of its sturdy construction and great fire-power. Pilots of the Red Air Fleet, trained by pilots of 151 Wing, finally took over the "Hurricanes," and since then thousands of these magnificent little fighters have been sent to Russia. They have played a leading part in the defeat of the Luftwaffe in the East, particularly as escort fighters for Stormovik dive-bombers.

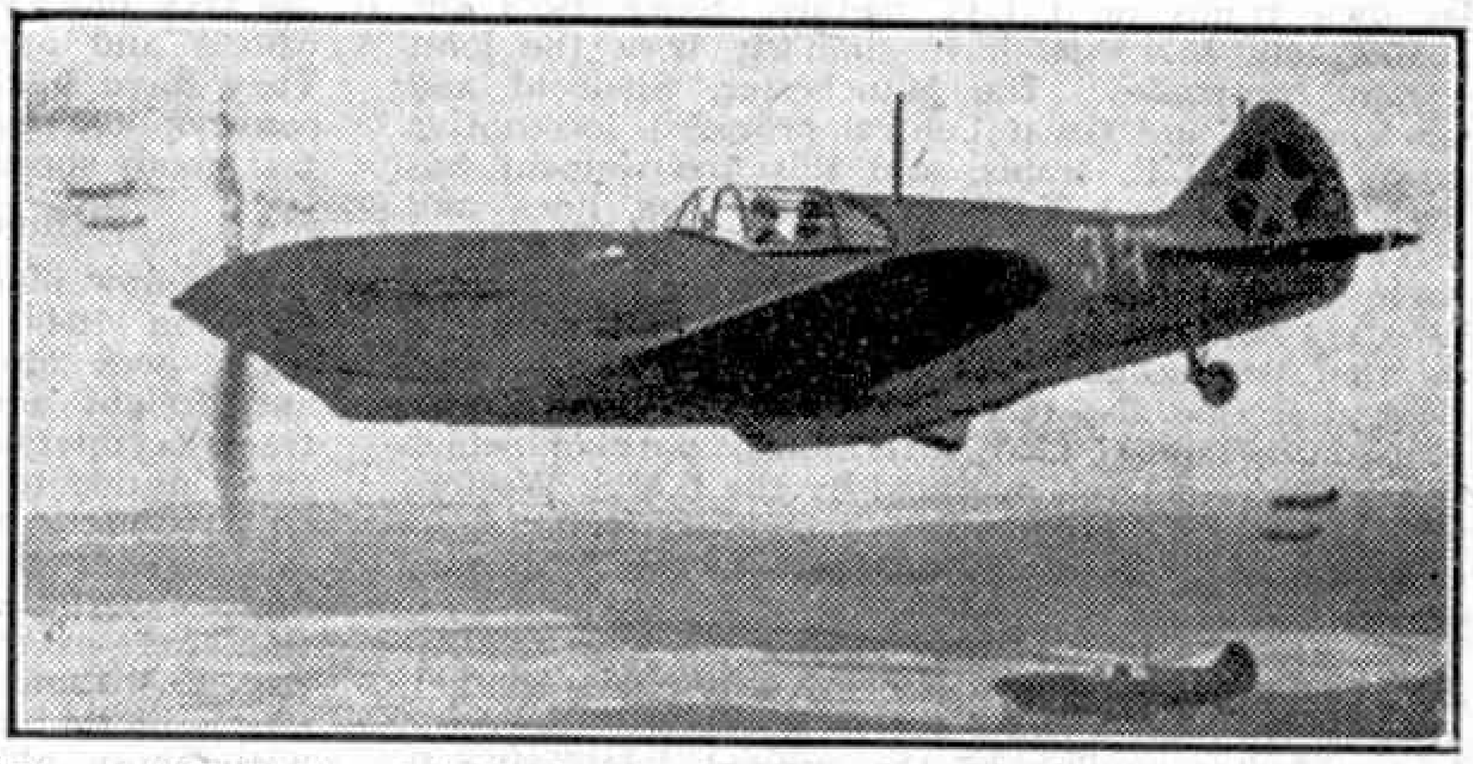
Apart from its great success in action, the "Hurricane" has had a profound influence on Russian design, and nearly all of the recent fighters produced in that country bear a distinct family likeness to it. With the exception of the radial-engined LAGG-5, the LAGG, MIG, and YAK series are all low wing monoplanes with in-line engines, inward-retracting undercarriages, enclosed cockpits fitted with rearward-sliding hoods, and have their radiators in the same position as that of the "Hurricane."

The three basic types from which all the later Red Air Force fighters have been developed are the YAK-1, MIG-1, and the LAGG-3.

The YAK-1, designed by Alexander Yakovlev, is covered almost entirely with plywood, only the control surfaces being fabric-covered. The monocoque fuselage is moulded in two longitudinal halves like that of the "Mosquito," and in contrast to most Russian fighters the roomy cockpit is placed well forward. The YAK-1 has a 1,100 h.p. M-105P engine which gives it a speed of about 345 m.p.h. A 20 mm. cannon is mounted between the engine cylinder blocks, firing through the airscrew hub, and a machine-gun is carried in each wing. In addition the YAK-1 was one of the first Russian fighters to be fitted for carrying rocket bombs under its wings. These vary in size up to about 250 lb., but the usual type weighs about 56 lb. For winter operations the YAK-1 can be put on skis. The YAK-9 is basically similar to the YAK-1, the most noticeable refinement being the "bubble" hood. A much more powerful engine, stated by Sweden to develop 1,800 h.p., gives the YAK-9 a speed of about 390 m.p.h., making it the fastest Russian warplane.

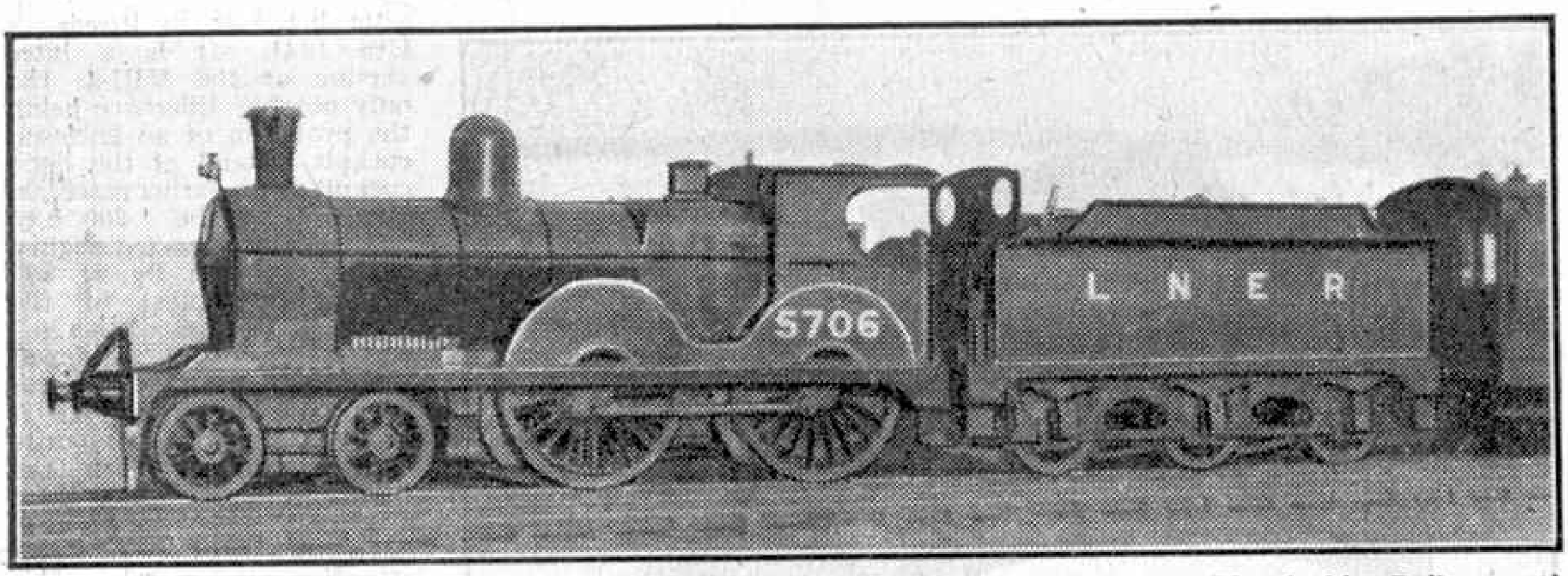
The MIG-3, designed by a committee under Ing. Guriev, was first mentioned by Lord Beaverbrook after his visit to Russia in late 1941. It is a later version of the MIG-1, the only notable difference being the provision of an enclosed cockpit instead of the open cockpit of the earlier machine. Powered by the 1 200 h.p. AM-35A liquid-cooled engine, the MIG-3 can fly at 360 m.p.h., and most of the leading squadrons of the Red Air Force were equipped with MIG-3s until quite recently. Like the YAK-1, the MIG-3 is of composite construction, as both the fuselage and wings are covered with plywood, although some of the structure is metal. This practice of combining wood and metal construction is most unusual but appears to be quite efficient.

The LAGG-3, also designed by a committee, under Lavochkin, is the latest Russian fighter about which detailed information is available. It is built entirely of wood, apart from its duralumin engine cowling, and has been described officially in this country as "well streamlined with a remarkably smooth finish." Like the YAK-1, the LAGG-3 has an M-105P engine which gives it a top speed of about 350 m.p.h. It suffers from the fault common to small, high-powered aircraft in that it is tricky to fly. In particular it tends to spin in a sharp turn. This has been partly cured by the use of slotted wings, and does not appear to have greatly affected the LAGG-3's usefulness. Every lesson taught by the war in the air has been built into this fighter. The fuel tanks are self-sealing, and exhaust gas is fed into them to reduce fire risk; heavy 9 mm. thick armour plate is fitted behind the pilot's seat, and comprehensive radio equipment is carried. Surprisingly, neither the windscreen nor the hood are bullet-proof, and there is no provision for jettisoning the hood in an emergency. For the 20 mm. Shpitalny-Vladimirov cannon 120 rounds of ammunition are provided and 220 rounds for each of the two 12.7 mm. Beresin machine-guns. Three 56 lb. rocket fragmentation bombs can be carried under each wing, and these have proved very effective against the Wehrmacht's panzer divisions, lorries and defence positions. In fact it has been stated that this bomb will penetrate up to 7 in. of armour-plate.



The LAGG-3, the latest Russian fighter aircraft about which detailed information is available.

The latest Russian fighter reported in action—the LAGG-5—differs little from the LAGG-3, but has the new 1,600 h.p. M-2 (*Continued on page 106*)



L.N.E.R. Class "D7" 4-4-0 No. 5706, built in 1891 for the Manchester, Sheffield and Lincolnshire Railway and used on the Cheshire Lines. The class is now extinct.

Railway News

The Cheshire Lines

The Cheshire Lines Railway is unique. The letters "C.L.C." are familiar on carriages and wagons, as well as on timetable or notice boards. The line books and carries an enormous amount of traffic in busy North-west England, including Lancashire; it owns the large and important Central termini in Liverpool and Manchester and 140 miles of track, yet no locomotives! There is a separate Cheshire lines management and full range of operating staff, proud of their railway's fine tradition of punctuality and service; yet in some ways the C.L.C. is not a railway in its own right because these initial letters stand for Cheshire Lines Committee.

The undertaking was originally incorporated under the combined auspices of the former Great Northern and Manchester, Sheffield and Lincolnshire (later Great Central) Railways, though soon afterwards the Midland joined as third partner. From 1866 to 1922 supreme control was jointly in the hands of those three companies, each of which worked its own trains on C.L.C. metals. Since 1923 the L.M.S. and L.N.E.R. have similarly been the joint parent companies. The Manchester, Sheffield and Lincolnshire and Great Central provided locomotive power for C.L.C. trains, and this arrangement has been continued by the L.N.E.R., the lines and services of which link with the C.L.C. in order to serve Manchester (Central), Liverpool (Central), Chester, Southport and other points of importance in the Merseyside and Wirral areas. The Great Central section also reaches Manchester over its own lines into London Road terminus, part of which station is owned and operated by the L.M.S. Western Division; the latter company's Midland trains, however, can only reach central Manchester by means of the C.L.C.

We illustrate one of the 4–4–0 types long familiar on Cheshire Lines secondary duties but now extinct. It was G.C. class "2," L.N.E.R. class "D7," and had a boiler similar to the present "J10" 0–6–0, but driving wheels 6 ft. 9 in. in diameter. A weather board for tender first running had been fitted, also an L.N.E.R. chimney. The larger and somewhat newer engines of the sister "D6" class, with 7-ft. driving wheels and piston valves, operated the Liverpool–Manchester "*Punctual*" expresses for over 40 years, and some of them with new superheater boilers are still taking an important share, although designed in Queen Victoria's Jubilee year of 1897. In their original state, with stovepipe chimneys, these eminent little engines shared the express workings on the opening of the Nottingham–London (Marylebone) extension in 1899. To-day a most interesting variety of L.N.E.R. and L.M.S. passenger and goods locomotives is to be seen on C.L.C. tracks, particularly in the vicinity of Stockport.

Stone for Track Ballast

Most readers will be familiar with the white or grey "ballast" that is used to build up the bed on which railway sleepers are laid. To a great extent this consists of crushed stone or granite chippings, and hundreds of thousands of tons of such materials are required annually in order that British railway tracks may be maintained at their usual standard of perfection.

The Southern Railway operates its own quarries at Meldon, on the northern fringes of Dartmoor, where tough stone is blasted away in large quantities by explosive charges about once a month, and is then conveyed to grading, crushing, and washing plants within the workings by means of a 2 ft. gauge light railway powered by Diesel locomotives. The finished chippings or aggregates, which are used also for platform surfaces and constructional purposes, are then stored in big bins beneath which trains of 10 bogie steel hopper wagons are run by gravity for loading. Those specially built wagons are very fine vehicles, 32 ft. long; they run on eight wheels and are vacuum as well as hand braked. They have a capacity of 40 tons, so that a train conveys 400 tons of material, running usually at fast goods speed hauled by a 2–6–0.

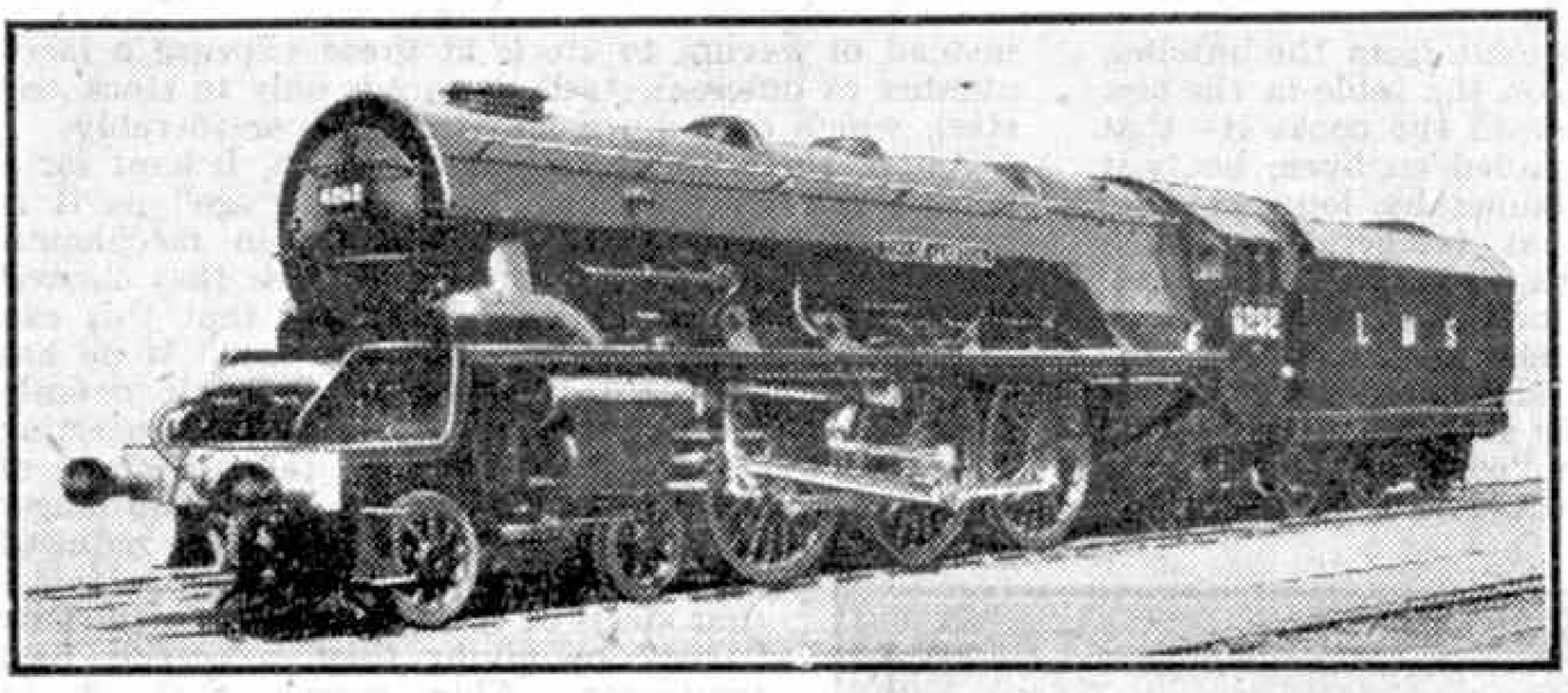
Huge L.M.S. Troop Movement

It is now officially announced that on an occasion early in 1944, when special troop and munition traffic was already heavy, and normal passenger and freight services were adding considerably to track occupation, the L.M.S. were required at very short notice to provide 167 extra special trains for an arriving contingent from overseas. The movement required 334 locomotives, 447 drivers and firemen, 1,700 carriages and 350 vans. Some destinations were over 400 miles away, yet the extra specials passed without hindrance or delay, thanks to the efforts of the control officers, working in conjunction with those of other lines whose routes might be affected. The distances covered by these trains totalled 26,222 miles, the whole job being completed in the remarkable time of 73 hours. It was the largest concentrated troop movement ever undertaken by the L.M.S.

American Railways in Wartime

The railways of the United States cover approximately 230,000 miles and are manned by a staff of 1,270,000. Class 1 lines, the principal ones, own 42,000 locomotives and 1¾ million freight cars with an average capacity of 50½ tons. The number of

passengers carried in 1942 was 667 million, a huge increase over 1941. Military traffic in 18 months involved the movement of 20 million service men, with an average journey of no less than 850 miles, and 80 million tons of Army freight also were conveyed. Figures regarding freight and passenger train loading, also locomotive mileage, rose considerably during the year under review, thus demonstrating



L.M.S. No. 6252 "City of Leicester" showing the latest development of the non-streamlined series of 4-6-2 "Coronation" class locomotives. This engine is the last of four, Nos. 6249-52, built during 1944, all with double blast pipes and chimneys. Photograph by courtesy of the L.M.S.

the importance in America, as here, of "The Lines Behind the Lines."

Southern Locomotive Notes

Observation in Kent recently revealed No. 1316 still on local freight duty from Ramsgate. Among numerous veterans she is now the eldest engine on the Eastern Section, and one of the very few early South Eastern "0" class to be rebuilt as now appearing with "01" domed boiler, having long survived all contemporaries as her building date was 1882. No. 1779, of the "L" 4–4–0 class, is still resplendent in malachite (light) green paint, being evidently in such good trim externally when recently going through shops that the peacetime finish needed only touching up.

"Pacific" 21C 7 "*Aberdeen and Commonwealth*," usually stationed at Salisbury, created a stir last Autumn by being the first 4–6–2 to appear in traffic on the Eastern Section. She was then working ordinary trains between Victoria and Ramsgate as a preliminary to a "boat express" trial with eight empty corridors and four Pullmans from London to Dover and back, when some notable uphill work was performed.

A new series of unstreamlined "Pacifics" of lighter construction is to be put in hand, numbered 21C 101 up, largely for the steep Exeter-Plymouth section, which has for many years been worked by 4–4–0 and 2–6–0 classes of moderate dimensions, as no locomotive of greater size or power has so far been permitted on the west or north Devon lines. The main line electric locomotive CC1 has been engaged in further express or semi-fast test trips from time to time, as well as regular freight haulage on the Mid-Sussex line. It is now painted bright green as for coaching stock, with yellow bands, shaded gilt lettering and red buffer beams. Another may be built shortly.

Several unusual examples of double-heading have been reported, including some ancient and modern contrasts. For instance "A12" 0–4–2 No. 641 of the Adams "Jubilee" class was seen leading "Q1" 0–6–0 C10 on a heavy special passenger train; another "A12" in company with a "T9" "Greyhound" 4–4–0 presented quite an old London and South Western picture; while Brighton "B4" 4–4–0 No. 2062 assisted "U1" 2–6–0 No. 1903 from Tonbridge to Charing Cross on an 11-coach express ex-Margate and Dover. The "B4" in the third example had worked from London Bridge to Tonbridge by way of Oxted and Tunbridge Wells, and would ordinarily have stood by at Tonbridge until next day; such a Central Division type on the Eastern main line is exceedingly rare between Sevenoaks and Charing Cross.

The latest scrapping news shows that inroads have been made into four different classes, though at the moment to the extent of only one engine from each. Two L.B.S.C. 4–4–2Ts withdrawn are Nos. 2600 and 2024. No. 2600 is an "11x" rebuilt from the "11" class rather unsuccessfully introduced in 1906, with 5 ft. 6 in. driving wheels, for outer suburban services, and long familiar on the Oxted lines. No. 2024 belongs to the once famous "13" series of express tank engines which 20–30 years ago shared principal main line duties in Sussex with the "Atlantics," 4–4–0s, and big six-coupled tanks. In 1909 No. 23, now 2023, of that class gave an excellent performance when working "*The Sunny South Express*" through between Brighton and Rugby alternately with "Precursor" L.N.W.R. 4–4–0 tender locomotive "*Titan*," during a test period.

From the Eastern Section the first "D" 4–4–0 to go is No. 1742, built in 1903 for Continental boat trains with Mr. Wainwright's smart express engine finish, including copper-capped chimney, polished brass dome, splasher beadings, and numbers on the cab sides. Perhaps more surprising is the withdrawal of No. 1747, a "D1" rebuilt from "D" in 1921 with new boiler, superheater and piston valves for fast Margate line services.

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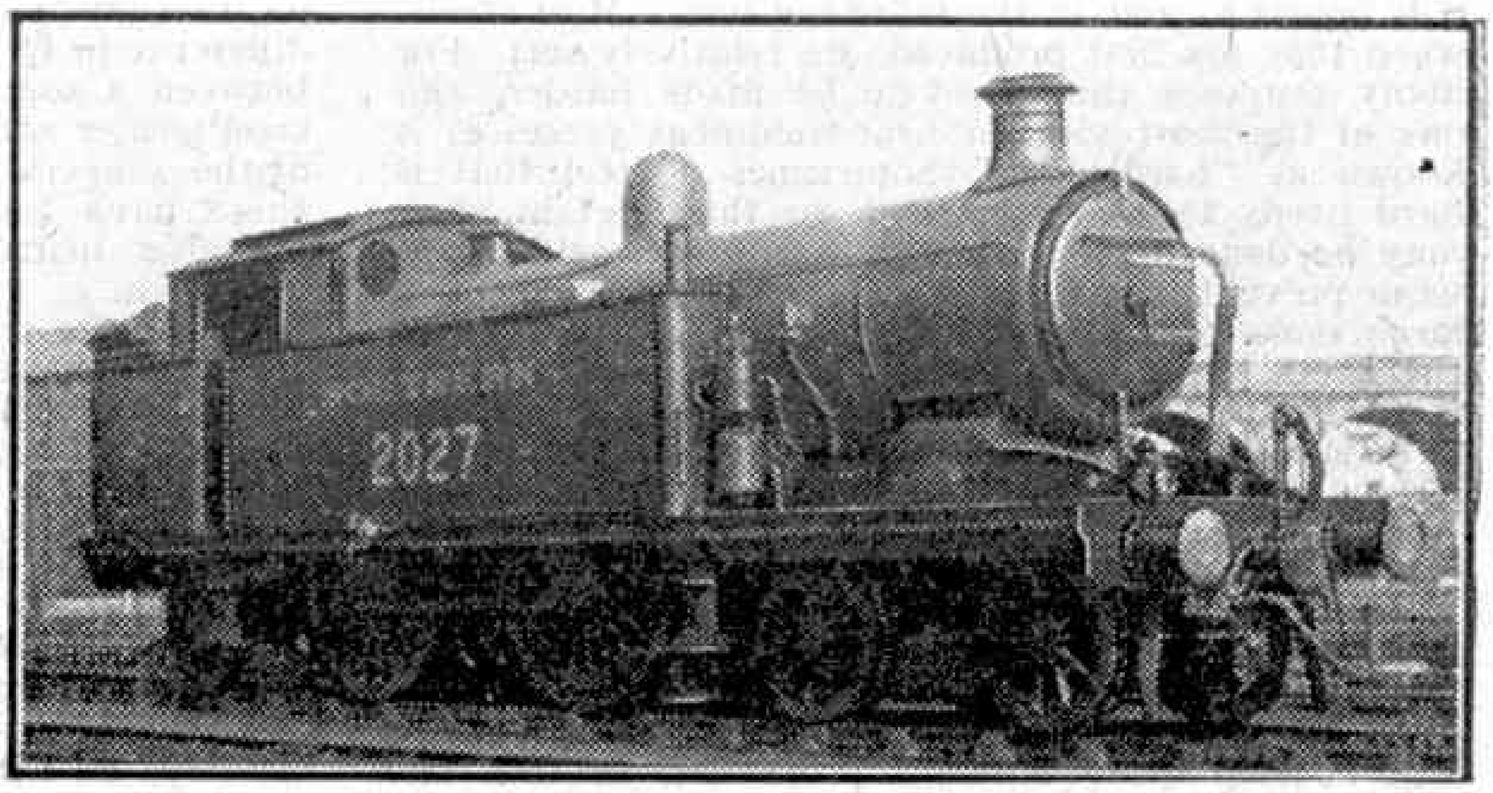
Recently a gang of six men took up in 4½ hrs. a half-mile section of L.M.S. track where subsidence due to mining had taken place. After levelling, the track was replaced and opened for traffic in just three days.



S.R. Class "13" 4-4-2T No. 2027. The first of this famous class of express tank engines has been withdrawn. Photograph by W. G. Boyden.

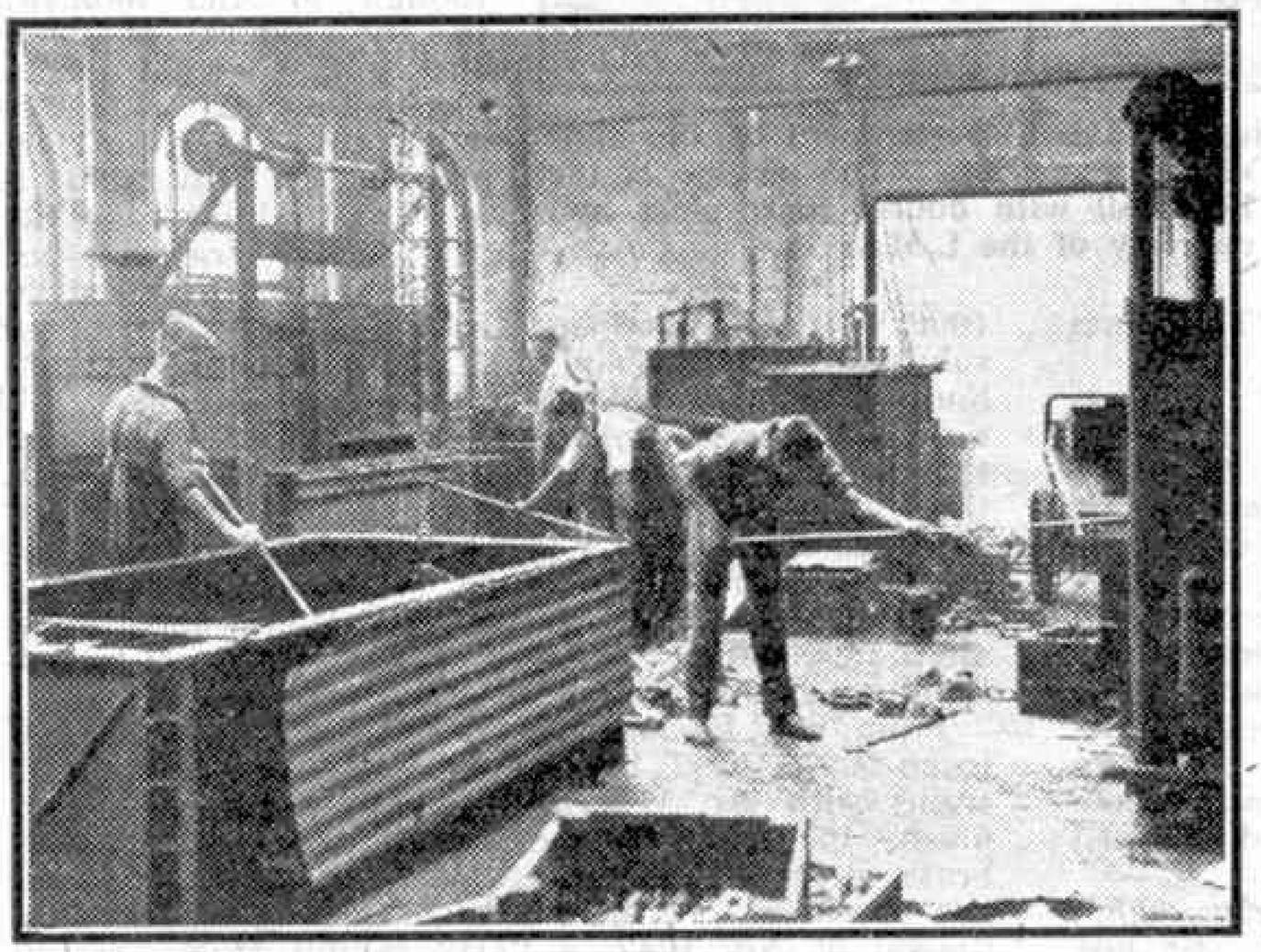
Facts About Steel

II—Heat Treatment and its Effects

By Eric N. Simons

WHEN mother receives the joint from the butcher, she does not set it down on the table in the raw state for father to carve. Instead she cooks it—that is she places it in a furnace called an oven, heats it to a temperature that she knows by long practice to be correct, maintains that temperature for a sufficient time, and then lays it "done to a turn" on the table to be sliced up for the family. In steelmakers' language, mother has "heat-treated" the joint, and when a steelmaker talks about heat-treating steel he means very much the same thing as mother does, only he does not call it "cooking."

Not all steel is heat-treated before it is sent away, but all good tool steel has to be so treated, and many other steels, such as those used for aircraft engine and motor-car engine parts, those used for magnets, and so forth, all have to be treated in one way or another before they are fit for use.



A modern heat treatment shop showing furnaces and quenching tanks. (Courtesy, Edgar Allen and Co. Ltd.)

Why is steel heat-treated? And what does this treatment do to it? The answers to these questions it is hoped to give in the following lines. Most steels, when they are first produced, are relatively soft. For many purposes they need to be made harder, and one of the most vital of heat-treatment processes is known as "hardening." Sometimes a steel that is hard needs to be re-softened, so that certain work may be done upon it that its hardness would otherwise prevent. Sometimes the cooling down of a large mass of steel, such as a steel casting, leaves the metal in a dangerously stressed and strained condition, and it has been found that by heat-treating it in a special way, these strains and stresses can be gradually eased off and removed. The kind of heat treatment is, then, largely dependent on what it is desired to do to the steel.

Sometimes it is desired to cut down, if possible, the number of steels of different compositions used in a works, and it has been found that certain of the alloy steels, given different types of heat-treatment, will develop quite different properties, so that one and the same steel can be used for quite different purposes if only the heat treatment is varied. Thus it is important to the steel user, because it means that instead of having to stock at great expense a large number of different steels, he needs only to stock one steel, which cuts down his steel bill considerably.

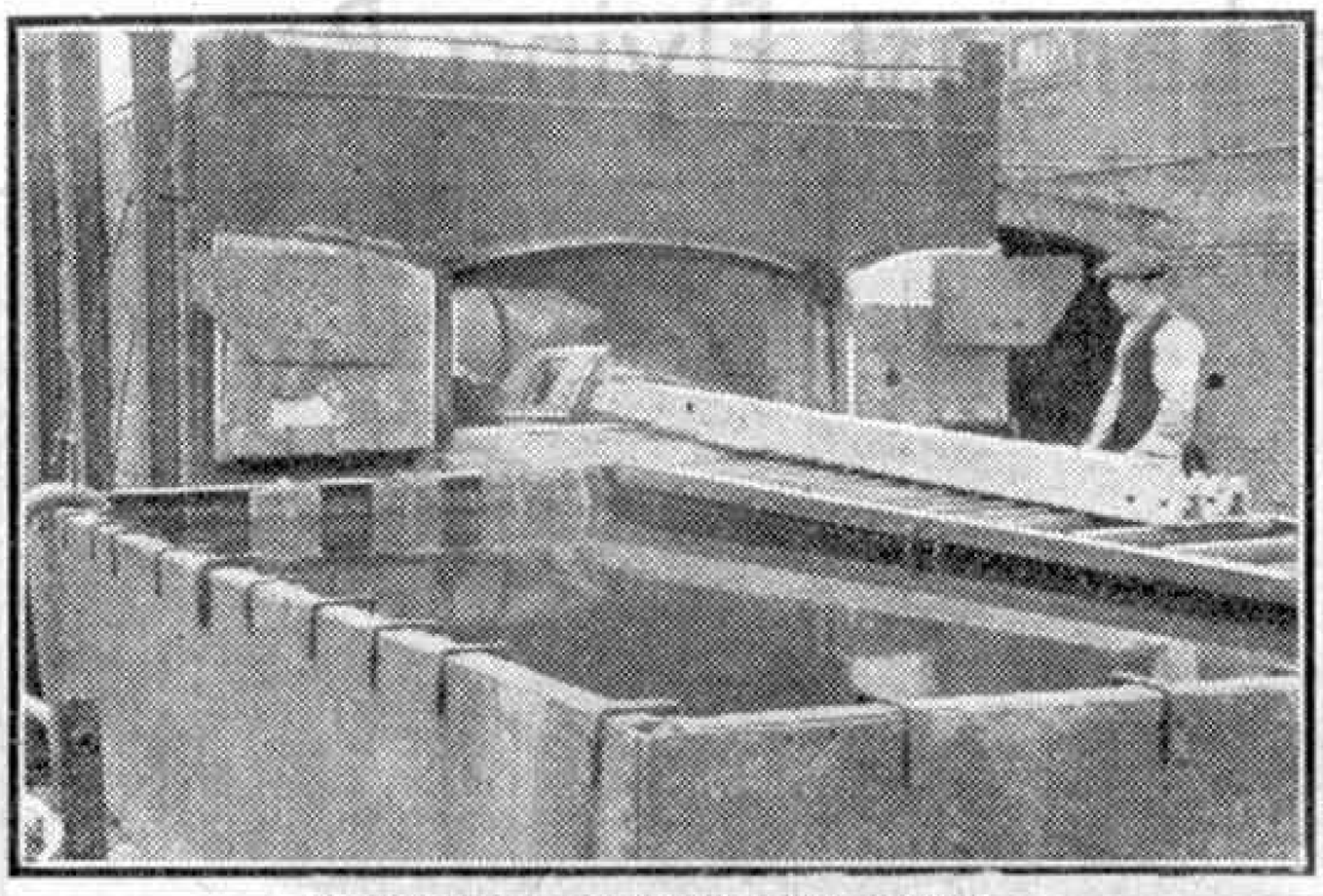
Again, there are certain steels which, if kept for a period, gradually become brittle, or "age" as it is called; or at all events they differ in mechanical properties after a certain time from those they showed when first received. You will realise that this can be extremely awkward for the steel user. If he has bought a steel because it possesses a certain definite strength and other properties, it is disconcerting and troublesome to find, when he takes a sheet of it out of stock a few months later, that it no longer possesses these properties to the required degree. Now the steelmaker has found that steels of this kind can be artificially "aged" by giving them a specific heat treatment. This means that if he produces steels to meet a certain demand, he can heat-treat them before they leave his works, and "age" them artificially by this means, after which they will not change any more. The user receiving this steel then knows that its properties will remain stable and will not change, however long he may keep it in stock.

The three most important heat-treatment operations on steel are however hardening, tempering, and annealing, and we shall try to describe these simply.

To harden a steel properly is a scientific operation calling for a precise knowledge of the correct temperature to which the steel must be heated in the furnace chosen. One great difference between cooking by mother and heat-treatment by the steelmaker or user is that mother more or less guesses at the temperature of the oven she is using.

Now steel is much more expensive than meat. Some steels cost eight or nine or ten shillings a pound, and so a great deal more depends here on the result of heat-treatment. The steelmaker cannot, therefore, afford to guess the temperature of his furnaces. Not only this, but the temperatures for the heat-treatment of steel are much more "critical" than for meat. In other words, whereas 10 or 20 degrees difference between the oven temperature on Monday and that on Tuesday will not much affect the joint, a similar difference in treating steel may make all the difference between a sound and a ruined bar or casting. The steel treater cannot dispense with accurate knowledge of the temperature of his furnaces, and for this reason there have been invented the most ingenious and valuable instruments for measuring furnace temperatures.

It is quite true that before these instruments were invented the steel treater had to rely on his eye alone, together with his skill and experience, for determining temperatures, and he often had amazing powers in this respect. There are still men who can tell with remarkable accuracy the temperature of a furnace by looking at its interior. But in those days the steels dealt with were much less complicated than those used to-day and the treatment temperatures were not nearly so critical. Consequently, a variation of a few degrees in the guess was less serious. To-day, as little as 10 degrees may be important, so that even the good guesser is glad of a pyrometer or temperature-measuring instrument to correct or confirm his clever guesses.



Quenching manganese steel casting.

The hardening of steel is carried out by heating the steel to exactly the right temperature for that steel, holding the temperature long enough for the heat to penetrate right through the material, and then swiftly plunging it into some form of cold hardening medium. This may be cold water, cold brine, cold or slightly warmed oil, or even a blast of cold air. The hotter the steel before it is quenched in this way, the greater the eventual hardness, and the lower the ductility. But this point must be noted. There are certain temperatures beyond which the steel must not be heated, or it will be spoiled. Hence the importance of knowing the right heating temperatures.

The speed with which the steel is cooled in the quenching medium is another important factor. If this speed varies, the hardness of the steel will vary. Why does this quenching harden steel at all? Put as simply as possible, the heating makes certain changes in the structure of the steel, that is the way in which its molecules are arranged; and the drastic quenching "freezes" this desirable structure, so to speak, so that it remains even after the steel has grown cold. Another point to be remembered is that the mass or bulk of the steel affects the hardness. Small pieces can be made much harder than bulky pieces. The reason is that the larger the piece, the longer it takes the chilling effect of the quench to penetrate into the interior; and the heat of the interior is extracted more slowly, so that the structure is not frozen so completely as at the surface.

Tempering is a highly essential operation with many steels because the hardening operation often leaves them in too brittle a condition for service. Tempering consists of reheating the hardened steel to a much lower temperature than the hardening temperature, and then letting it cool down. There are two types of tempering. In one, the temperature of reheating is low. It is used for carbon tool steels, and it leaves the hardness almost unaltered, but takes away the brittleness. In the other, the temperature of tempering is considerably higher, up to 650 deg. C. This is used mostly for constructional steels, which have to be tough and strong, yet able to resist sudden shock and fatigue. As the tempering temperature increases, hardness of the steel declines, but its toughness and ductility are improved. The tempering operation can be completely controlled, so as to yield whatever combination of hardness, strength and toughness is desired. That is why it is such a useful operation. It enables the steelmaker to pick the right qualities for his steel as a football captain picks his team.

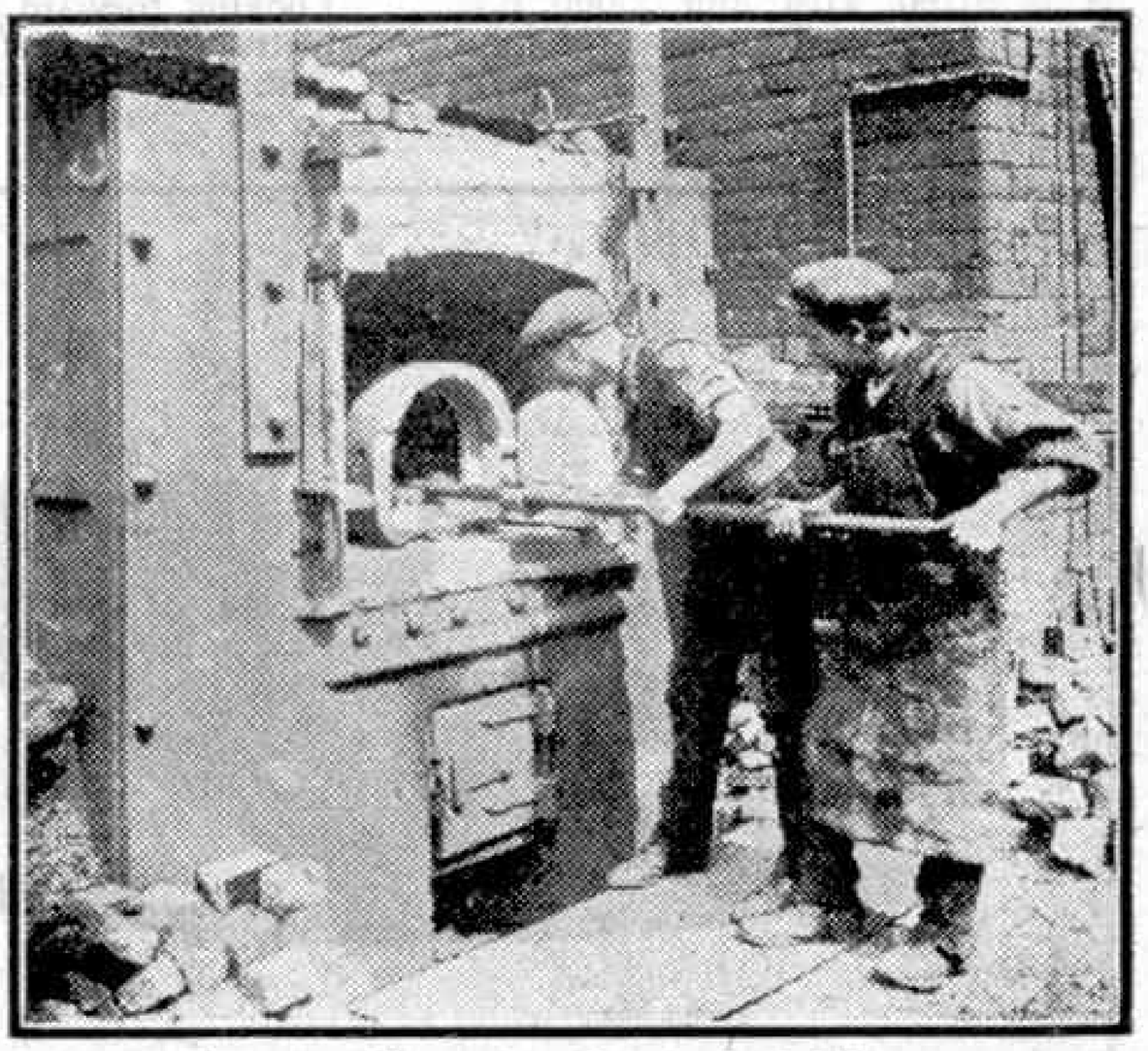
Annealing must not be confused with tempering. Tempering always means a reheating, usually after hardening or quenching, or after the steel has been cold-worked in some way, for example by hammering or rolling. In annealing, the temperatures are usually higher than for tempering, though not so high as for hardening, and the effect is one of softening the steel. In fact, the reader should substitute the word softening for annealing if he wants to form a clear picture in his mind of what this operation does. In many old historical novels, writers with little knowledge refer to knights with trusty "well-annealed" swords. Well-annealed swords would do relatively little damage to the enemy, because the blade would be too soft to cut.

Users often want a steel in the soft state, so that they can turn, shape or bore it in the machine. Annealing softens it for them. But it does other things as well. It liberates the metal from those internal stresses that have been set up as a result of hot-working, for example rolling, forging, casting, pressing, die-stamping, etc. But annealing has no connection whatsoever with hardening and tempering. It is essentially a hardness-removing operation.

A very similar form of treatment is "normalising." The difference between this and annealing is relatively small. In annealing, the steel is heated to the right temperature in a furnace, and allowed to cool down in the furnace. In normalising, it is removed from the furnace and allowed to cool down in air. Normalising gives ordinary steel a much greater degree of tensile strength than will annealing, and it improves other mechanical properties of the material.

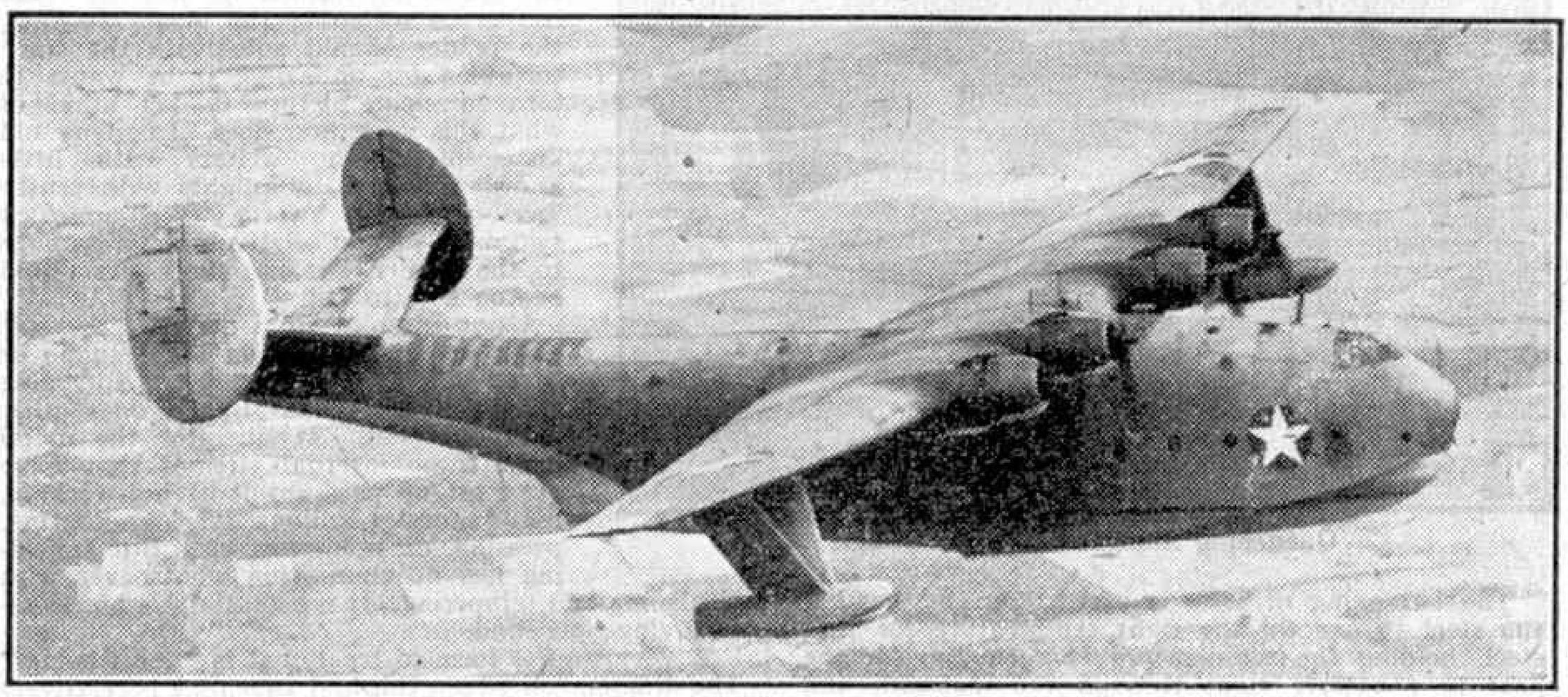
A steel treatment furnace is a scientifically built and designed instrument. It may be heated by coal, gas, petroleum, oil, or electricity. Gas—which may be either "natural," obtained from the town's supply, or specially produced by suitable plant at the steel works itself—and electricity, are the most commonly used.

Of late years a good deal has been learned about controlling the atmosphere inside heat-treatment furnaces. If no attempt at control is made, there is a tendency for the steel in the furnace to become oxidised, that is oxygen from the air in the furnace combines with the iron in the steel to form iron oxide, so that the steel is left with a scale on the surface which makes matters more difficult in the later stages, blankets off the (*Continued on page 106*)



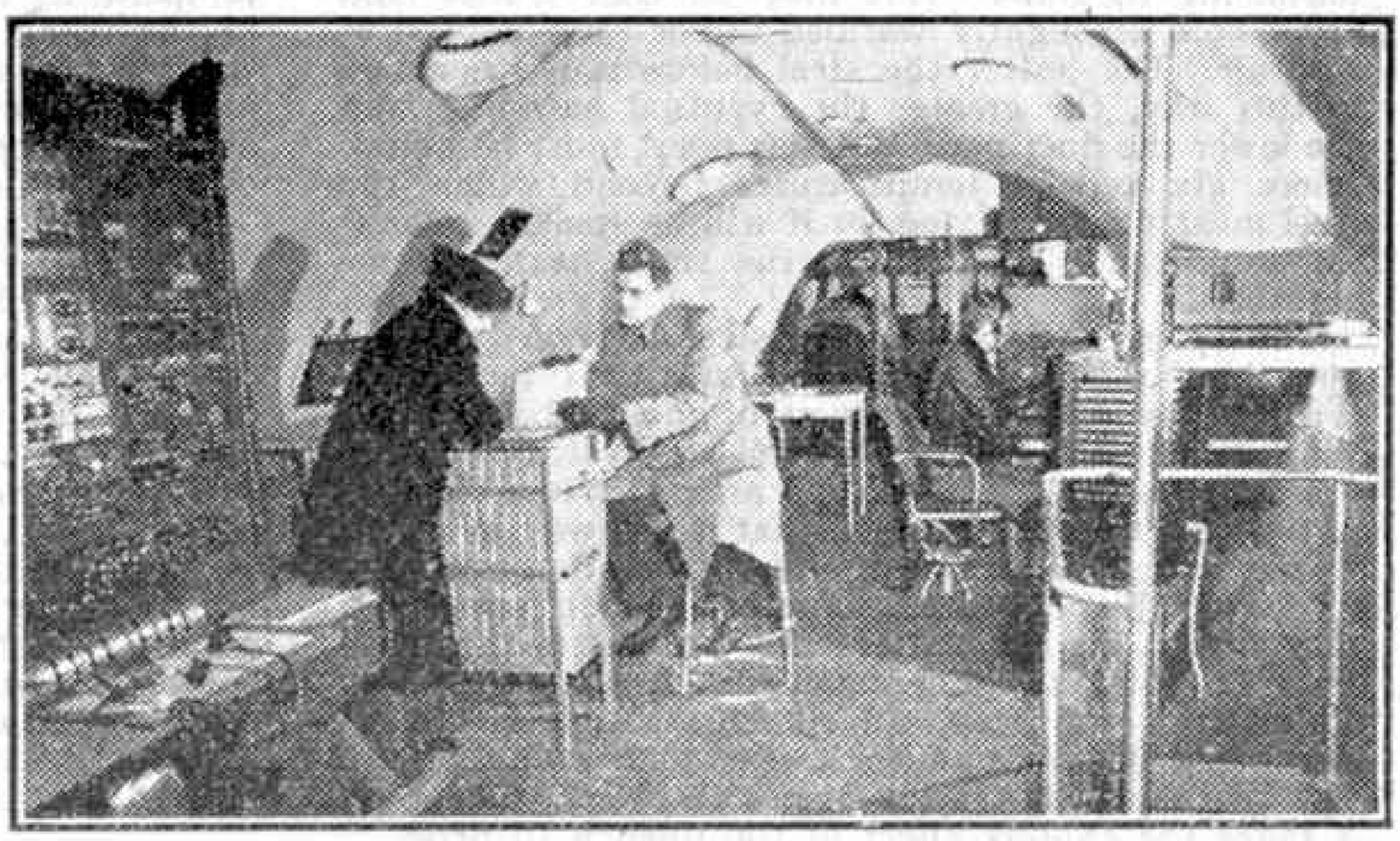
An annealing stove for tool steel bars.

The World's Largest Flying Boat

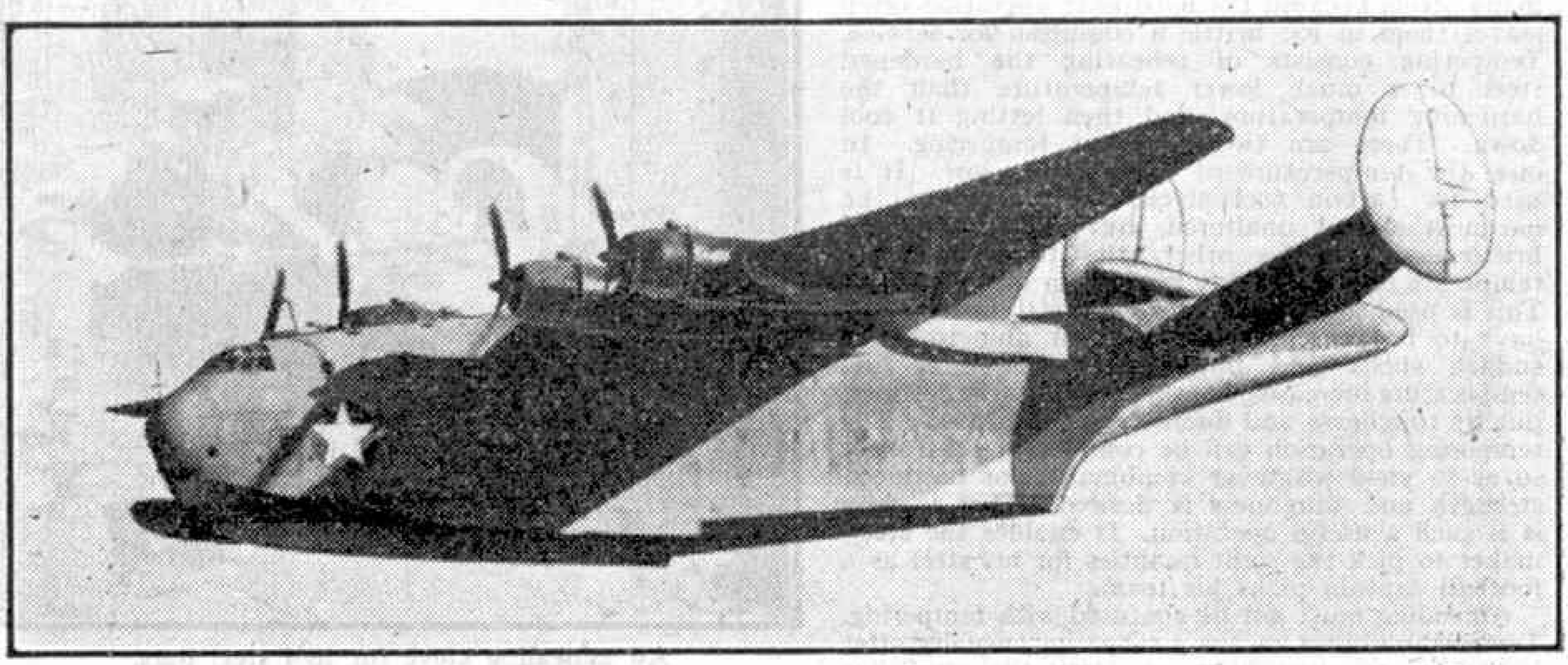


"Mars" in the air. The crew of about 15 includes three pilots and two navigators.

"Mars," the world's largest flying boat, was built as an experimental Patrol-Bomber, but later was converted into a naval cargo transport and in this capacity is in service with the U.S. Navy. Its first service flight was a 4,375 miles non-stop "hop" over the Atlantic from a Naval air station in Maryland to Natal, Brazil, with 13,000 lb. of mail and freight for the armed Forces. This 62½-ton giant has a wing span of 200 ft., is 170 ft. long and has two decks. The upper or flight deck and part of the lower or main one are "pressurised" for comfortable travel at great heights. It is fitted with four 2,000 h.p. Wright "Duplex Cyclone" engines.



Looking forward along the flight deck. On the left is the navigator's instrument panel and table, and on the right the wireless operator's post. The stand-by pilot has a table and chair between the navigator's position and the cockpit.



Another view of the world's largest flying boat in flight.

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception of those issued by the Scientific and Children's Book Clubs, which are available only to members, and certain others that will be indicated, these should be ordered through a bookseller. We can supply copies to readers who are unable to place orders in this manner. Order from Book Department, Meccano Ltd., Binns Road, Liverpool 13, adding 6d. for postage.

Owing to wartime difficulties, it is impossible to guarantee prompt delivery of books ordered as described at the head of this page, but every effort will be made to ensure speedy despatch.

"THE McINTOSH LOCOMOTIVES OF THE CALEDONIAN RAILWAY"

By A. B. McLeod (Ian Allan. 3/6)

This attractive publication, which is an addition to the "A.B.C. Locomotive Series," will appeal to all locomotive enthusiasts, and especially to those who are historically minded. It puts on record many items that are of interest, with particular regard to the engines turned out for the Caledonian Railway, now part of the L.M.S., to the designs of J. F. McIntosh, who was Chief Mechanical Engineer of the company from 1895 until 1914. His reign covered first the advent of larger-boilered locomotives, and in this movement McIntosh was a pioneer. Then followed the development of the six-coupled express locomotive, of which his productions were among the biggest of their day, and the application of superheating, in which too he was a pioneer, at least in Scotland.

The descriptions are accompanied by illustrations that cover practically the whole of the McIntosh classes of engines and give a splendid idea of the fine blue Caledonian locomotives in that line's palmiest days. Various features combined to produce a definite Caledonian "type," no matter what the wheel arrangement, and there was a consistent elegance about the engines that was well in keeping with the pleasing Caledonian livery and trappings. This reached its peak in the large-wheeled 4-6-0s, a series of engines that were regularly assigned to the hardest turns on the line and, what seems strange to us now, with individual engine crews for considerable periods. Details are given of the principal dimensions and the members of the engines concerned, and there is a brief account of each class, with a table showing how the renumbering effected by the L.M.S. was applied to the McIntosh engines, so that the sturdy survivors can be identified by the present-day enthusiast.

Mr. McLeod, whose researches into Caledonian locomotive matters must be considerable, has done a good job in thus collecting and setting on record the many items of interest that make up the present book. It can be obtained from A.B.C. Mail Order Dept., 33, Knollys Road, Streatham, London S.W.16, price 3/8 post free.

"OUR RAILWAY HISTORY" (PART 3)

By Rixon Bucknall 3/6

We have already reviewed the first two parts of Mr. Bucknall's story. In this third part he tells the stories of the five Scottish railways of the days before grouping. These are the North British, the Caledonian, the Glasgow and South Western, the Highland, and the Great North of Scotland. Each of these railways had an interesting history, and all had characteristics that made them individual and alive. Thus they give the author splendid opportunities for his pleasant style, and the result is a readable book packed with interesting stories, especially of historic locomotives and the men who built them A useful addition is a series of notes on the liveries of the companies dealt with in the three volumes of the book, and there are excellent illustrations.

Copies of the book can be obtained from Mr. Rixon Bucknall, 71, Witley Court, Woburn Place, London W.C.1, price 3/9 post free.

"TENTS IN THE WILDERNESS"

By J. E. Lips (Harrap. 7/6 net)

There are still Indians in the snowy wilderness of Labrador, trapping fur-bearing animals on their hunting grounds throughout the Winter and travelling in the Summer to the posts of the Hudson's Bay Company to trade their skins for guns and ammunition and other necessities. These are the Naskapis, and in this fine book we have the story of one of them, Pirre, a boy of 14, who at that early age becomes a capable hunter, alive to the dangers and responsibilities of the life followed by his tribe.

We meet Pirre first with other members of his family at the Summer encampment, where he takes part in the bargainings that accompany the purchase of goods from the agent of the Hudson's Bay Company. Then we travel with him by canoe into the wilds where the family hunting ground is situated, and there we see how he achieves manhood by regular hunting and trapping in the snow, by killing his first bear, and by going to the aid of other Indians overtaken by misfortune. The reader finds the story of the boy and his various companions of the deepest interest throughout, and from their activities learns much about Indian customs, and their ways of making canoes, snowshoes, baskets, traps, and so on. Every character in the story stands out sharply and it is fascinating to read of the way in which the Indian families stand by each other when hard conditions make this necessary. The character of the wild country in which they live also is finely described.

Altogether this is a delightful book, with three full-page illustrations and other small ones in the text.

"THE A.B.C. OF LONDON TRANSPORT SERVICES"

By Barrington Tatford (Ian Allan. 2/-)

The London Passenger Transport Board controls the greatest urban transport system in the world, and the only one to combine buses, coaches, tramways, trolley buses, underground and surface railways under one management. Its activities therefore form an interesting subject for a booklet such as this, one of the now well-known "A.B.C." series.

A brief survey of the origin of the familiar "L.P.T.B." gives us a good start. Then we pass to the various railways, in which the motive vehicles, both steam and electric, of the former Metropolitan and the District lines receive attention. Tramcars are next dealt with. The classification of the different types is explained and there is a numerical list of the cars. The same scheme is followed in succeeding sections dealing with trolley buses, motor buses and coaches, and many interesting details about particular vehicles are included.

Each section includes details of the depots and garages where the road vehicles are stationed, together with particulars of the principal types allocated to each; and there are plenty of illustrations throughout the 48 pages comprising the booklet, which can be obtained from A.B.C. Mail Order Dept., 33, Knollys Road, Streatham, London S.W.16, price 2/2 post free.

Union Castle passenger liner "Pretoria Castle" before conversion to experimental aircraft carrier.

An Experimental Aircraft Carrier

By Denis Rebbeck, M.A. (Cantab.), M.I.N.A., A.M.I.Mech.E.

A LARGE number of merchant ships in this war have been converted to aircraft carriers, some as they were building on the slip, some when just completed, and some after they had already been in use on their normal routine work. The most interesting, and apparently one of the most extensive, conversions has recently been completed in this country. A former Union Castle passenger liner, the *"Pretoria Castle"* has had her superstructure cut away and a flight deck constructed in its place, and now serves the Royal Navy as an experimental aircraft carrier. On board this well-known ship, now H.M.S. *"Pretoria Castle,"* representatives of the British and American aircraft industries can carefully watch their products being tested under the exacting conditions experienced while operating at sea.

This fine ship was built by Harland and Wolff Ltd., and launched at Belfast in October 1938. She has a length overall of 594 ft., a length B.P. of 560 ft., a breadth moulded of 76 ft., a depth moulded of 37 ft. and a gross tonnage of 17,388. The propelling machinery consists of two Harland-B. and W. 8-cylinder double-acting two cycle Diesel engines having a total output of 19,750 I.H.P.

As a passenger liner the *"Pretoria Castle"* carried out only two voyages until the summer of 1939, in both cases to South Africa, before she was taken over by the Royal Navy, and immediately converted into an armed merchant cruiser. H.M.S. *"Pretoria Castle"* operated for several months in the South Atlantic and then returned to a shipyard for her second and more extensive conversion—this time into an experimental aircraft carrier.

Fleet Air Arm pilots and observers on this experimental carrier, under the command of Comdr. Peter Bramwell, D.S.O., D.S.C., R.N., test anything from new types of flying helmets and "Mae Wests" to deck-landing possibilities of new types of aircraft. The manufacturers and aircrews are then able to pool suggestions on the spot for the improvement of the particular equipment that is on trial. The ship is used also for other types of tests, such as determining the wind-speed necessary down the flight deck in order that various types of aircraft with varying loads may take off. The information is then issued to Fleet and Escort carriers.

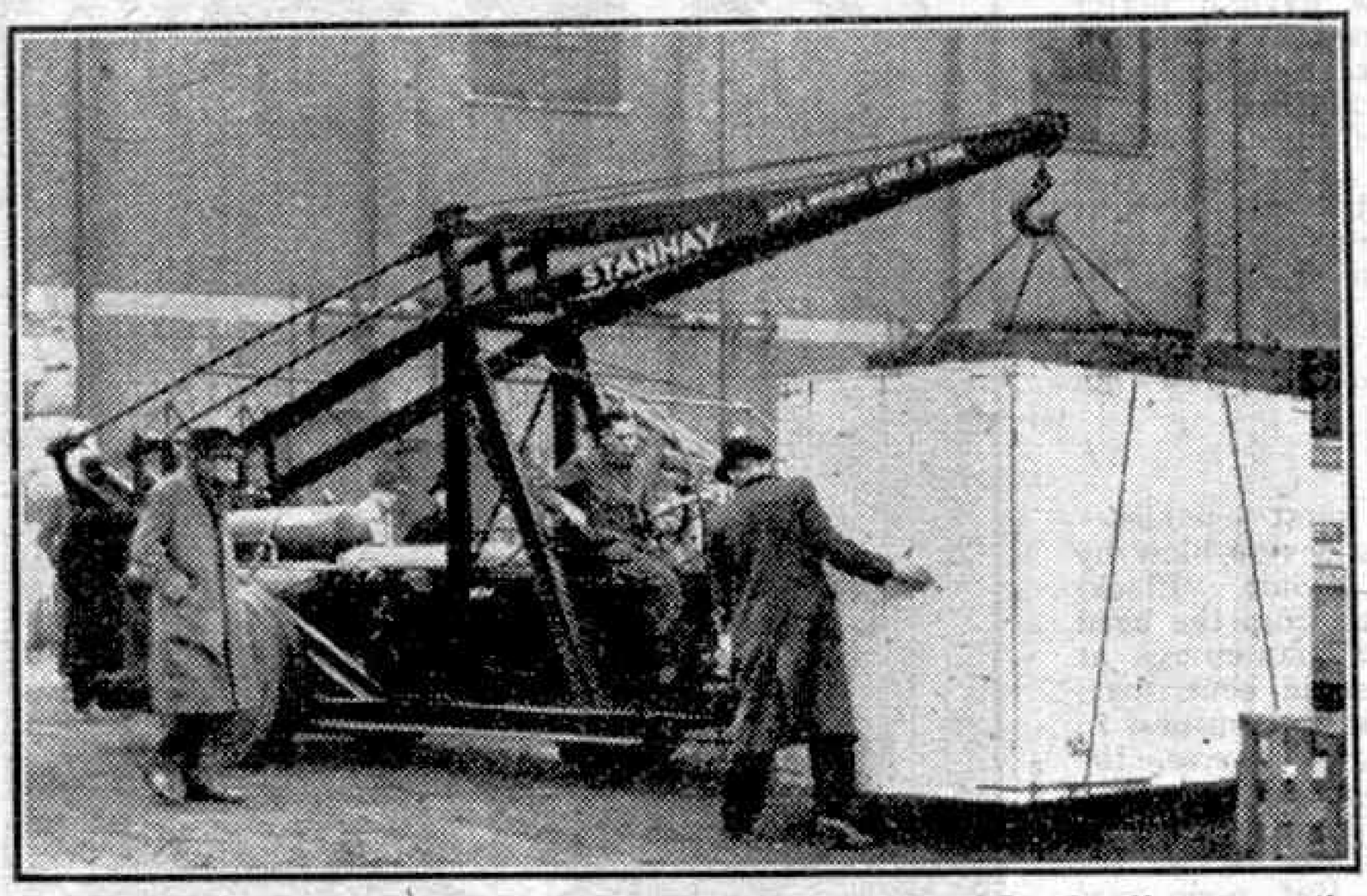
Another problem which is being tackled on this ship is the standardisation of British and American methods of signalling instructions to pilots for landing on, and taking off from, aircraft carriers. When British and American carriers are operating together in the coming months in the Pacific, against the Japanese, it obviously will be necessary to achieve maximum efficiency and interchangeability so that the carriers may operate as a combined force.

The captain of H.M.S. *"Pretoria Castle"* is Vice-Admiral R. B. Davies, V.C., C.B., D.S.O., A.F.C., one of the most senior pilots in the Fleet Air Arm. At the beginning of the war he was Rear-Admiral Commanding Naval Air Stations, but towards the end of 1941 he was retired with the rank of Vice-Admiral. He went to sea again as a convoy commodore, until he was given command of a new escort aircraft carrier which he joined in America. He was later recalled to the Admiralty, where he served as a commodore until given command of this vessel.

Engineering News

1,000-Mile Oil Pipe-line Built in Secret

An engineering secret of the war was disclosed by the British Government recently, when details were made public of a great oil pipe-line 1,000 miles long that has been constructed in Britain to link up ports on the south and north-western coasts with the London area and storage depots near important airfields. The objects of this tremendous pipe system were to provide additional and alternative routes for delivery of aviation spirit from the ports to the storage depots, in the event of the terminals being bombed, and to meet the needs of the "D-Day" forces and the requirements of British and Allied Air Forces on the Continent.



There are no winches, gears or chains in the 3-ton "Stanhay" pneumatic mobile crane. It is built on a standard Fordson Tractor with heavily ballasted wheels. Photograph by courtesy of Mechanical Developments Ltd., Southborough, Tunbridge Wells.

Construction of the system was started in April 1941, when air attacks on our ports and "U" Boat attacks on our shipping were at their height, and was finally completed last March. At one point the lines running to the airfield storage depots climb to more than 1,000 ft. above sea level, and so complete is the system that at some airfields bombers can be fuelled direct from the coast ports merely by turning on a tap! Scores of secret pumping stations with powerful pumps keep the supplies flowing smoothly.

The pipe-lines are laid underground, and villagers who saw the work in progress thought it was an emergency water supply system for cities that had suffered damage in air raids. To-day crops flourish over the buried pipes.

The pipe-line cost £7,000,000 to construct and absorbed 80,000 tons of steel. Over 900 men worked for nearly three years to complete the immense task of constructing it.

A Pneumatic Tyre Pioneer

There died in Birmingham recently a man who was associated with the development of the pneumatic tyre in its earliest days. He was Mr. John Hall, and he had been associated with the Dunlop Company for more than 50 years. When he was 21 years old Mr. Hall entered the world's first pneumatic tyre workshop, the Dunlop factory in Dale Street, Coventry, as an operative. At that time cycle tyres cost five guineas a pair, and the charge for mending a puncture was often as much as £1. The customer had to leave the wheel behind for attention and call back for it several months later! Rather than wait all that time cyclists often bought a new wheel. Mr. Hall's first job was to put the tube into the casing and fit the rubber tread. In those days this was done by hand and the operation took about an hour. To-day it is done in a minute. Mr. Hall eventually became the works manager, and himself helped in the development of the tyre by work regarding the ingredients mixed with the rubber.

New Swedish Power Station

In order to meet an increasing demand for electric power in Stockholm another hydro-electric plant has been built in Sweden and is now in operation. It is known as the Järpströmen, and is situated on a branch of the Indal River. At present the station is equipped with two generator sets, having a combined capacity of 80,000 kW, but when fully equipped it will have three sets with capacity totalling 120,000 kW. A discharge tunnel three miles long and 40 ft. wide was blasted under an old river bed in order to create a head of 210 ft. In some places the discharge tunnel is as deep as 650 ft. below the earth's surface, and the machinery hall is situated at a depth of about 200 ft.

A Mobile Crane without Winches or Gearing

A new kind of light mobile crane in which there are none of the usual crane mechanisms such as hoisting winches and gearing, and also no load chains or ropes, has been designed by Mechanical Developments Ltd., Southborough, Tunbridge Wells. The crane is designed to lift loads of one or three tons, and is shown in the illustration on this page.

The crane is operated on the pneumatic principle, and has a Fordson tractor as its basis. Mounted on this is a welded channel-steel superstructure that carries the jib, a cast-iron power cylinder at the rear and two air pressure tanks, placed one on each side of the cylinder. Air pressure is supplied by a small compressor mounted on the off side of the tractor and driven from a power take-off shaft. The compressed air cylinder has a bore and stroke of 18 in., and its piston is connected directly to a system of bell crank levers, which in turn are linked by strong tie-rods to the jib. When air pressure is applied to the cylinder the piston pushes the piston rod, and the bell crank levers and tie rods turn the pivoted jib so that the jib head is raised. The load hook is attached directly to the jib head.

The crane has great stability. This is obtained partly by mounting the power unit and pressure tanks well to the rear of the chassis, but mainly by ballasting the large rear wheels of the tractor with sand. The jib is available in either 12 ft. or 16 ft. lengths.

One use to which this crane could be put at the present time would be in removing the many thousands of road blocks that form such conspicuous features of our towns and countryside.

Air News

Another New Vickers-Armstrongs Transport

The designing of another Vickers-Armstrongs aircraft for post-war commercial air service is well advanced. It will be designated the V.C.1, and will be able to carry 27 passengers, and about 3,000 lb. of freight, baggage and air mail which will be stowed in compartments beneath the cabin floor. The V.C.1 will be a twin-engined machine with Bristol "Hercules" engines, have a wing span of 89 ft. 3 in., and be 62 ft. 7 in. long.

Royal Canadian Air Force Rescue Unit

Aircrews unfortunate enough to have to make a forced landing in the wild and sparsely populated country between Edmonton and Whitehorse, Yukon Territory, Canada, now have a better chance of being located and rescued. An R.C.A.F. parachute search and rescue division with personnel who have had special first-aid and medical training has been formed, and is attached to the North-East Air Command, R.C.A.F. The aircraft used by this division are equipped with four litters and carry oxygen apparatus, and the crews wear crash helmets, cages to protect their faces, and protective clothing. They have two-way radio equipment and, of course, carry food and other essential supplies.

The G-Suit

One of the fighter pilot's worst enemies—black-out—has just been dealt a severe blow by the development of the Berger G-Suit. "Black-out" is caused by blood draining from the head to the stomach during violent manœuvres at high speed, due to an increase in centrifugal force. This causes temporary unconsciousness in bad cases, during which time, of course, the pilot is at the mercy of his opponent.

All sorts of schemes have been tested to counter "black-out," including placing of the pilot in the prone position. But none was completely successful. The Berger G-suit seems to have solved the problem. It is a tight-fitting suit, made in three pieces—a girdle round the stomach and two leggings. It is secured by laces and zipp fasteners and is lined with five rubber air bags, one in the front of the girdle, and one on each thigh and calf. Air pressure obtained from the vacuum system of the aircraft inflates the bags, exerting pressure on the blood vessels as necessary.

The G-Suit was first tested on operational sorties by the American 339th Fighter Group, flying "Mustangs." It proved so successful that it is now coming into wide use among fighter squadrons.

J.W.R.T.

Qantas Developments

Qantas Empire Airways have ordered several Avro "York" transports. It is believed that the machines will be fitted up for the Empire service and will carry 30 to 32 passengers seated, or 20 passengers with sleeping accommodation. Full provision will be made for the supply of hot meals during flight. An interesting sidelight on this announcement is that the first machine bought by Q.A.N.T.A.S. in 1920 was an Avro, fitted with a Sunbeam "Dyak" engine.

The company recently bought the assets and rights of Carpenter's Airlines in regard to the Australia-New Guinea service. This involves a route of about 2,287 miles, which owing to wartime conditions is at present in suspension.

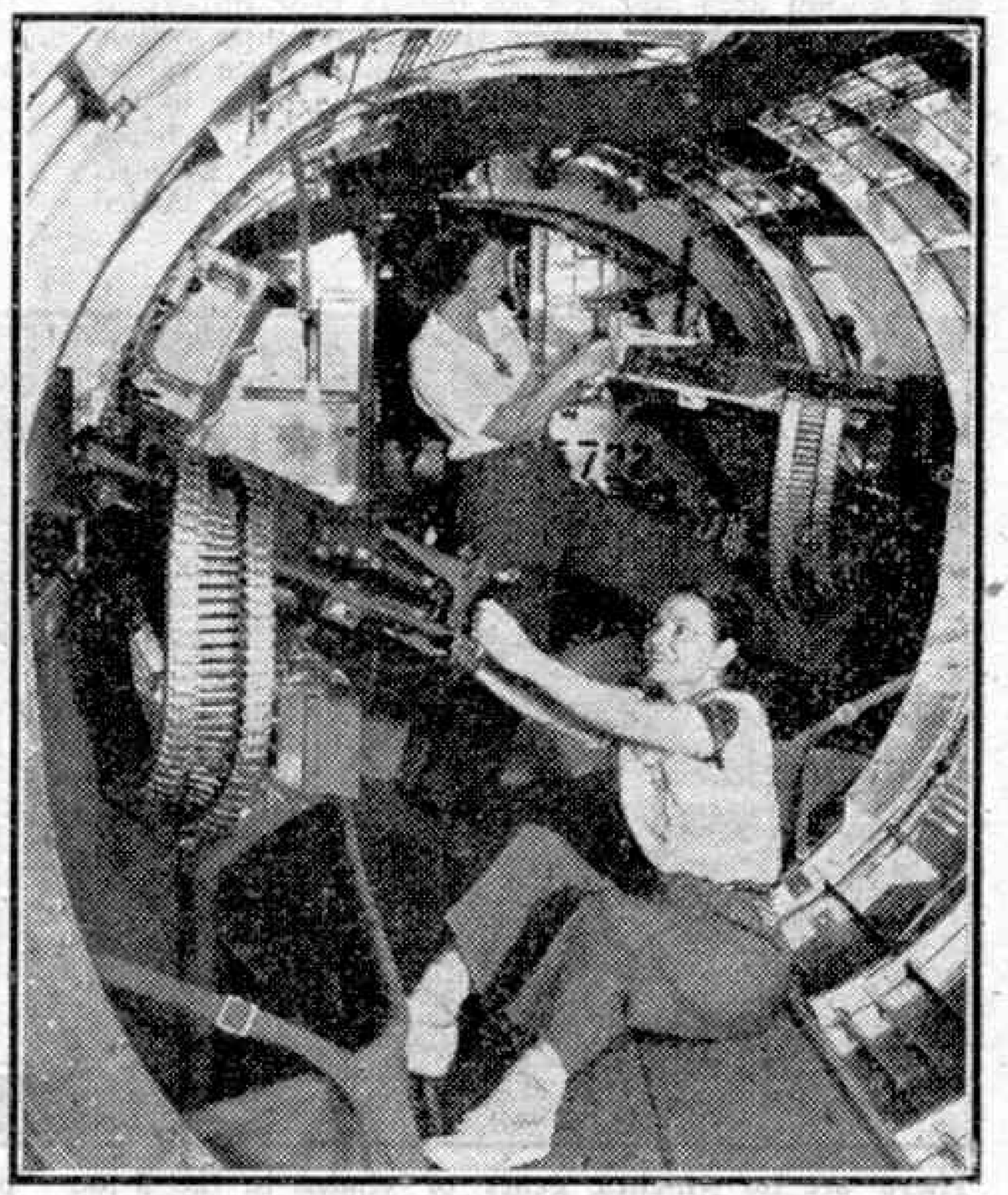
* * * *

The huge total of 96,369 aircraft of all types were produced in the United States last year.

The Versatile "Mossie"

The apparently endless stream of "Mosquito" variations continues, and two more Marks have just been taken off the secret list. Both are high-altitude reconnaissance-bombers.

The "Mosquito" XVI is the first British warplane with a pressure cabin of which details have been released, and an interesting feature is that a 1,650 h.p. Merlin 72 is mounted on the starboard wing and a Merlin 73, of similar power but which also drives the cabin-supercharger, on the port wing. The bomb-



Final assembly workers demonstrating the new staggered waist gun positions of the "Flying Fortress." Photograph by courtesy of Lockheed Aircraft Corporation, U.S.A.

load may comprise either one 4,000 lb. "cookie" in the fuselage or four 500 lb. bombs in the fuselage and one 500 lb. under each wing. The wing bombs are interchangeable with 50-gall. drop fuel tanks, which give the B.XVI a range of 1,500 miles and the P.R.XVI a range of 2,000 miles. The maximum speed of the "Mosquito" XVI is well over 400 m.p.h. and its service ceiling 36,000 feet.

The "Mosquito" Mark IX is, in general, similar to the Mark XVI, but its cabin is not pressurised. This obviates the necessity for a Merlin 73 "cabin-blower" installation, and so the Mark IX is powered by two Merlin 72s.

Both these versions of the "Mosquito" are used by the Light Night Striking Force of the R.A.F. Path-finder Force. The L.N.S.F. was formed by Air Vice-Marshal D. C. T. Bennett to attack strategic targets in Germany on nights when the weather prevented large-scale bombing, and to ensure that towns like Berlin receive harassing attacks even when the British "heavies" are engaged elsewhere.

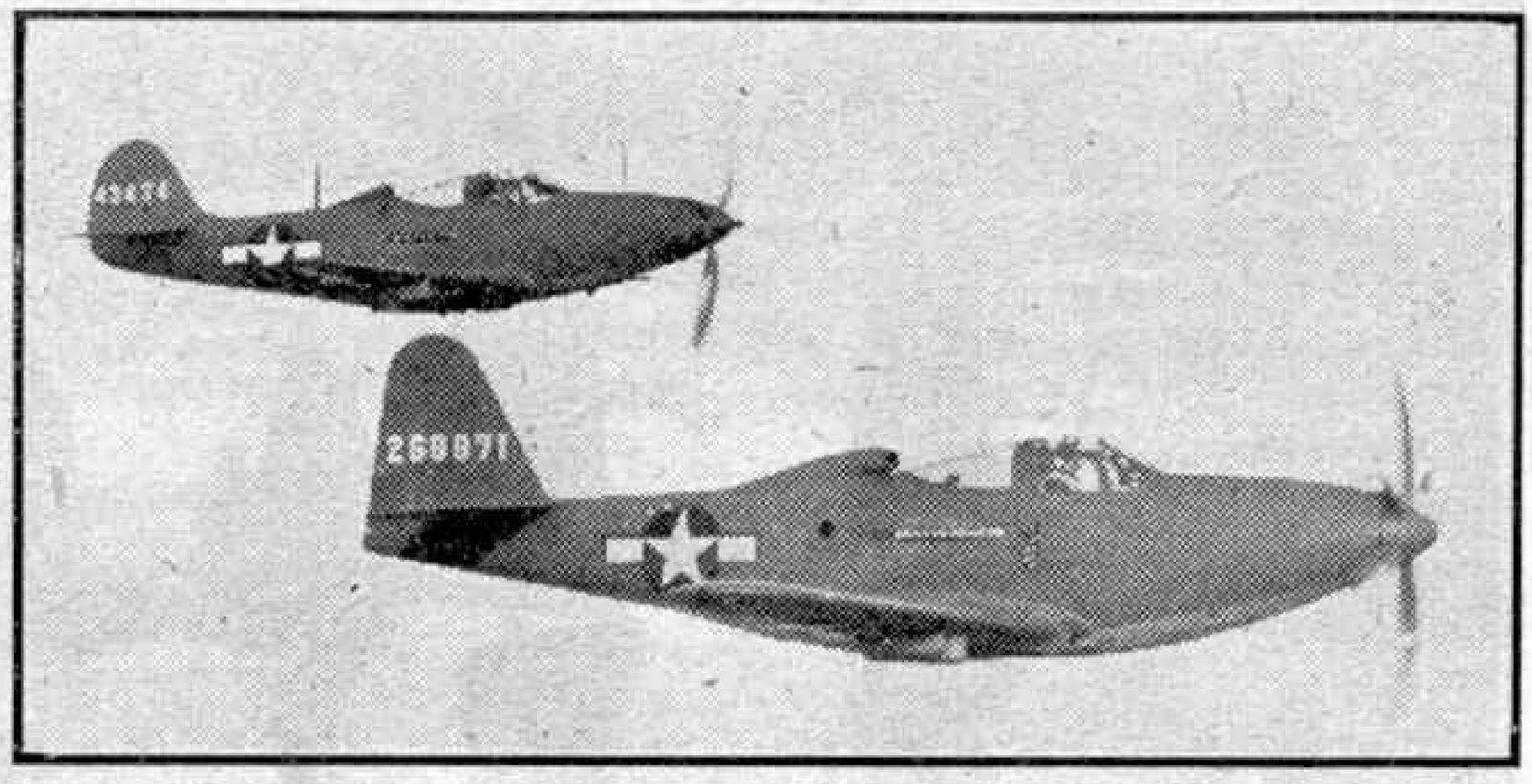
The high speed of the "Mosquito" enables it to take advantage of short breaks in the weather, and its high service ceiling is the finest possible protection against enemy flak and fighters. As a result losses are small and bombing results excellent. J.W.R.T.

* * * *

The Royal Australian Air Force is 40 times stronger than it was in 1939.

New Bell Fighters

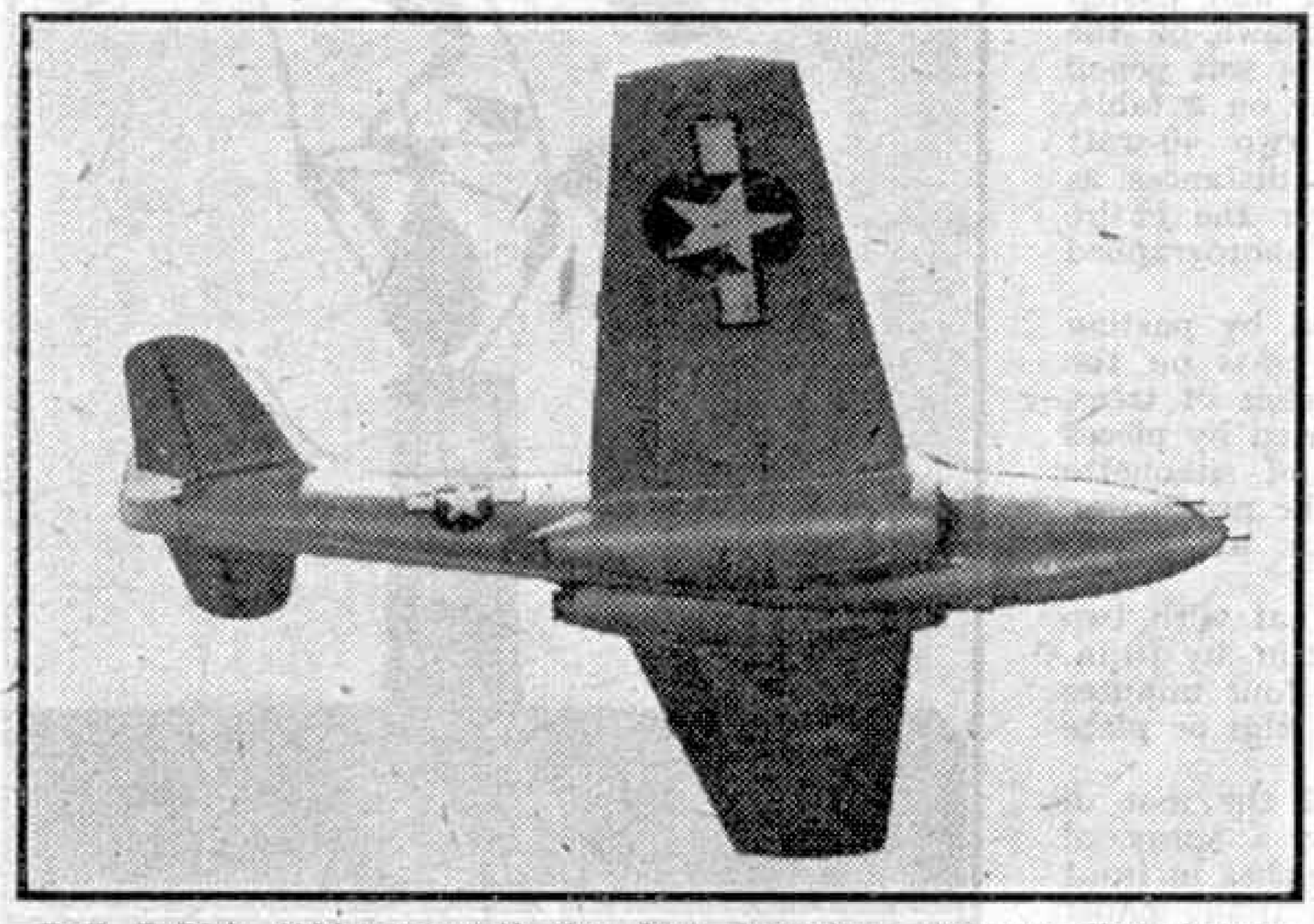
Two new fighter aircraft now in production in the United States are the Bell "Kingcobra" and "Airacomet." The P-63 "Kingcobra," shown in the upper photograph on this page, is a heavier, more powerful, and more streamlined version of the old P-39 "Airacobra" that is putting in so much good service with the Red Air Force. Its performance is, however, very much better than that of the earlier machine. It is some 25 m.p.h. faster, having a top speed of just under 400 m.p.h.; while its service ceiling of 35,000 ft. is about 5,000 ft. more than that of the "Airacobra." But the most outstanding improvement is in combat range, which has been increased by 50 per cent., making the "Kingcobra" more suitable for long-range operations in the Pacific war-zone. These high performance figures are attributable to two main features—the 1,500 h.p. two-stage supercharged Allison V-12 engine, and the wing, which has a laminar-flow type of aerofoil. By speeding up the airflow over the wing, this type of aerofoil increases lift and decreases drag. The "Kingcobra" has the same armament as the "Airacobra," with a 37 mm. cannon firing through the airscrew hub, two .50-in. guns on top of the fuselage, and two under the wings. As in the case of the "Airacobra," the "Kingcobra's" engine is behind the pilot, and there is a tricycle undercarriage.



The Bell P-63 "Kingcobra" fighter and above it the P-39 "Airacobra" fighter. Photograph by courtesy of Bell Aircraft Corporation, U.S.A.

The P-59 "Airacomet," illustrated at the bottom of this page, is even more unorthodox than the "Kingcobra," as it is the first American reaction-propelled fighter aircraft. It is powered by two engines of the type designed by the British Group-Captain Frank Whittle and first used in the Gloster E28/39 prototype. The engines are being built by the General Electric Company of America. The "Airacomet," which has been nicknamed "Swish" by the U.S.A.A.F., has a laminar-flow wing of 49 ft. span, and a tricycle undercarriage. It has an armament of four .50 in. guns, mounted in the nose, and has racks under its wings for either bombs or drop fuel tanks. Incidentally it is so free of the vibration worries often encountered with modern high-speed aircraft that a vibrator has been fitted to the pilot's instrument panel to prevent the needles from sticking. No details of performance may be given yet, but the top speed is well above 400 m.p.h. Although it has not yet been in action, the "Airacomet" is already being used for operational training.

J.W.R.T.



Bell P-59A "Airacomet," the first American jet-propelled fighter. Photograph by Bell Aircraft Corporation through Michael Lorant.

Chemical De-Icing

A new chemical de-icing lacquer for propellers has been developed by the Hamilton Standard Propeller Division of United Aircraft. The new de-icer, which is named "Icelac," when painted or sprayed on the blades, affords complete protection for a considerable time. It is an easily-applied black liquid, and dries with a shiny, tacky surface. "Icelac" was given a thorough testing on 20 of American Airlines' flagships during the Winter of 1943-44. After some 6,000 flying hours the results were pronounced satisfactory, and American Airlines have placed a contract for regular supplies of "Icelac" sufficient for 30 airliners.

The normal method of propeller de-icing is by means of the slinger-ring type of equipment which sprays anti-freeze liquid on the blades during flight. The advantages of "Icelac" over this method are obvious. It requires no fluid, and consequently cannot become exhausted at inopportune moments. The slinger-ring system weighs 10 lb. per propeller, and requires a further 10 lb. of fluid for each hour of operation. "Icelac" adds only 4 oz. to the weight of each propeller. This means a saving of more than 100 lb. for a large aeroplane on a long flight. In addition it is simple to apply and needs next to no attention once it is in place.

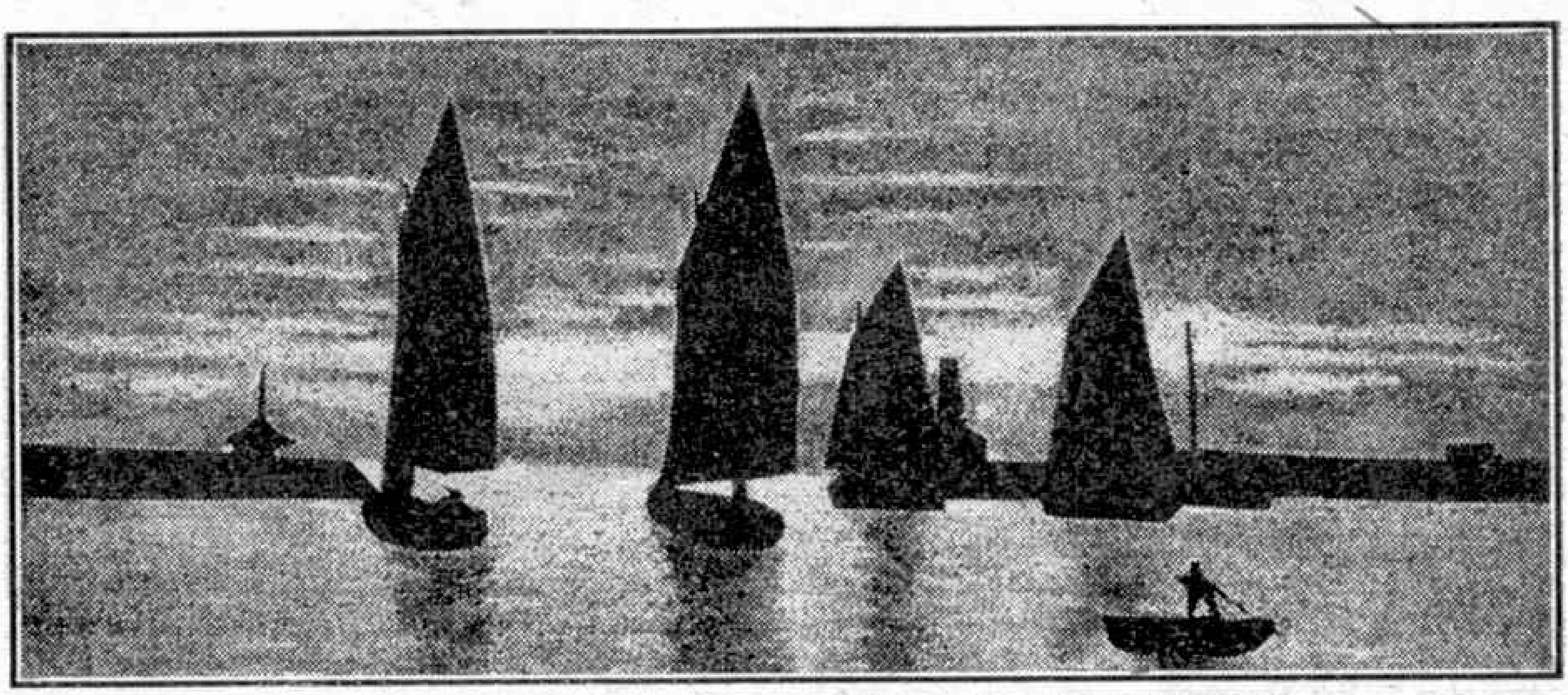
J.W.R.T.

* * * *

A new torpedo-plane, designed by Chance Vought, is now in production at the Allentown, U.S.A., plant of the Consolidated-Vultee Aircraft Corporation, under the designation TBY-2 "Sea Wolf." The new aircraft weighs eight tons and carries a crew of four—pilot, gunner, radio operator, and bomb-aimer. Its armament consists of machine-guns, torpedoes and bombs.

* * * *

A great new airport is under construction at Johannesburg by the South African Government, at an estimated cost of £4,000,000.



"Outward Bound," an effective silhouette photograph by H. Bastin, Reading.

Photography

Silhouette Pictures

A BRANCH of photography that provides plenty of scope for pleasant indoor experiments is that of making silhouettes, that is, black shadow-like pictures such as those formed by the shadow of a person or object. Examples of pictures of this type are shown on this page.

Silhouettes are admirable for use in making photographic greetings cards, calendars, and for passe-partout mounting, and they are very easily prepared. The only materials required are a piece of clear white glass from a discarded picture frame about 12 in. by 10 in., a sheet of white tissue paper of the same dimensions, a small pair of sharp scissors and a penknife, one or two unmounted photographic prints of human figures, animals or flowers, some paste, and two or three candles.

The very effective picture "*Outward Bound*" shown at the top of this page was produced in the following manner: First a sheet of tissue paper was pasted on to a sheet of glass. Then the boats and quay walls were cut out from an old print and pasted to the glass. The sky and sea were drawn on the paper with a piece of black crayon or a soft pencil.

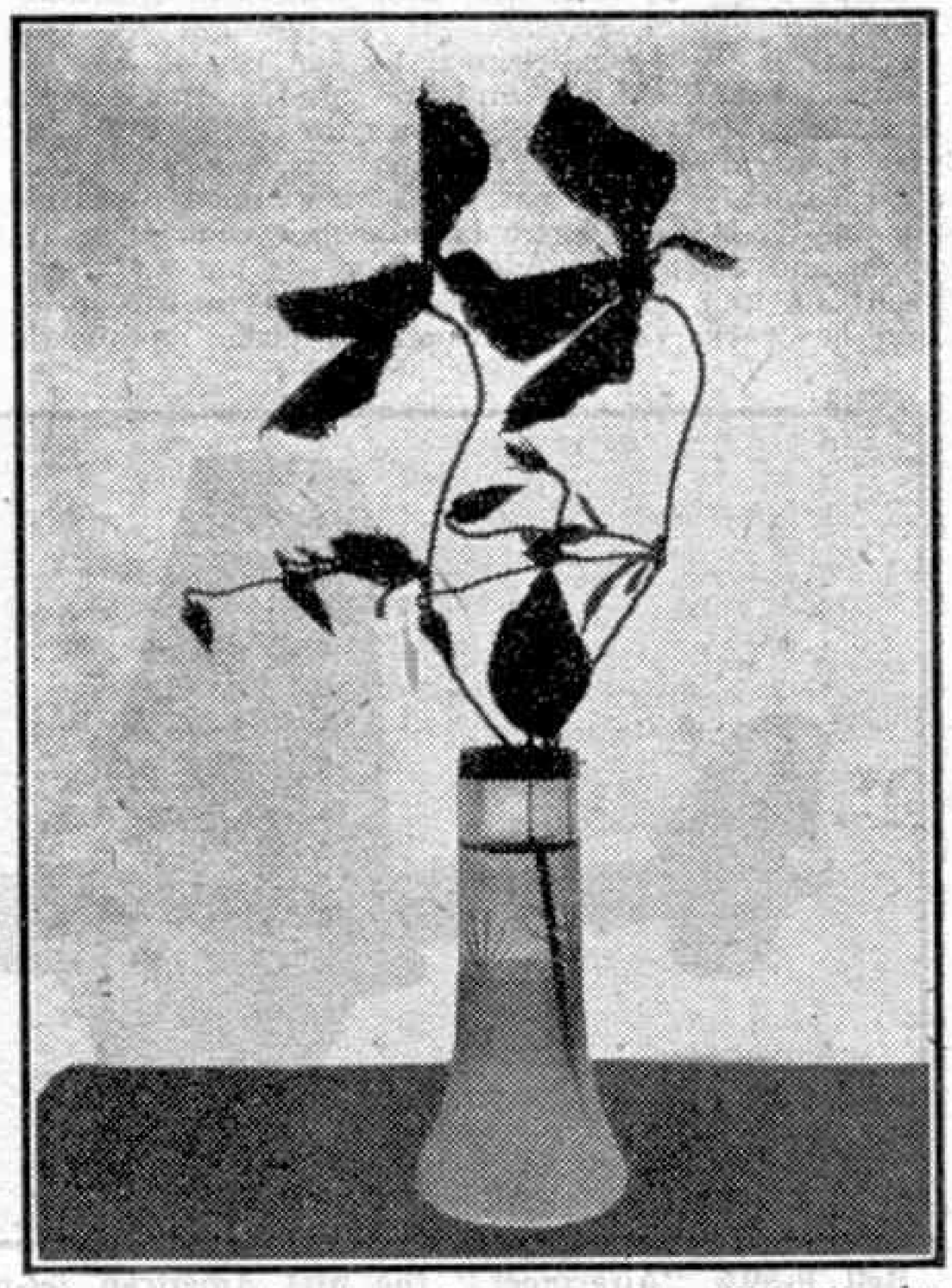
The glass was then propped vertically on a table, and one or two lighted candles or two 40-watt globes were placed behind it at such distances as to give even distribution of light over the entire area of the glass. The scene was then photographed and printed in the normal manner.

In some cases the effect is improved by pasting pieces of black paper and blades of grass on the glass, to suggest the trunks and branches of trees, while rocks and hills also may be imitated by pieces cut from black paper. This method of silhouette making is particularly well suited for the production of humorous effects, and this pastime alone will provide many a pleasant evening.

As a general rule it will be found that with two candles placed about 12 in. behind a 12 in. by 10 in. screen, an exposure of about three to four minutes will be required, assuming that a fast film or plate is used with a lens aperture of F/11.

In the picture "*Clematis*," shown at the foot of this page, the silhouette is made by a spray of Clematis in a glass vase placed a few inches in front of a glass screen to which a piece of tissue paper was pasted. The lights were at the rear of the glass and the picture was photographed and printed in the usual manner.

Readers who wish to make humorous silhouettes will find it good fun to investigate the possibilities of simple figures formed from matchsticks, pipe cleaners or bent wire. With these it is easy to make up really amusing groups of people or animals in all kinds of attitudes, and the field for experiment is limited only by the experimenter's imagination and capabilities. The figures may be stuck to the tissue paper screen with Seccotine, or simply placed against it while they are photographed. In the latter case the outlines will be slightly blurred, and this is an advantage in certain kinds of pictures as it gives very pleasing "soft" effects. A little experience of this fascinating pastime will show that it is an ideal method of passing happy evenings indoors.



"Clematis." Another photograph in silhouette by H. Bastin, Reading.

From Our Readers

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

THE KALKA—SIMLA RAILWAY

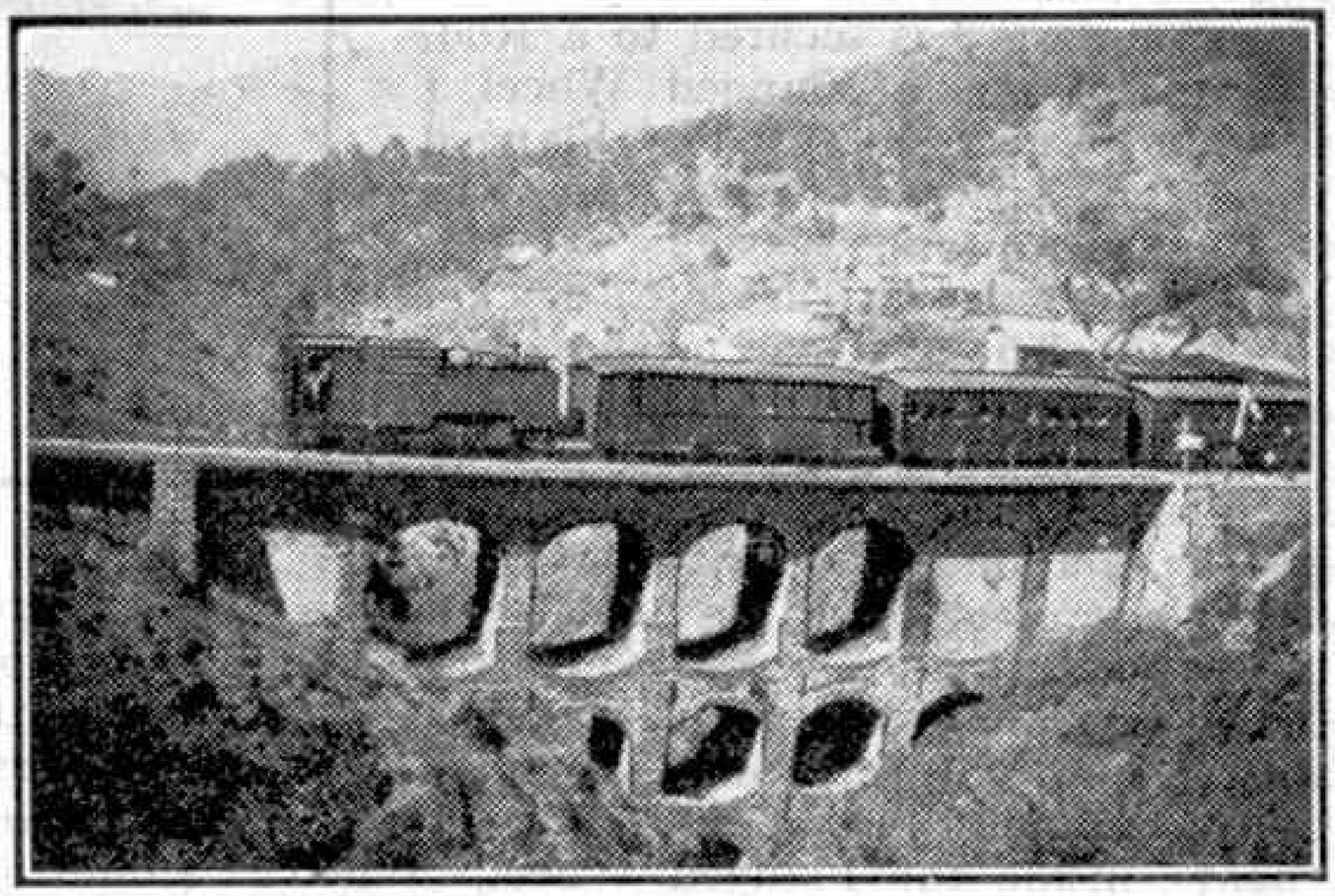
This Indian mountain railway runs from Kalka, which is 2,000 ft. above sea level, to Simla, about 5,000 ft. higher, the latter being the residence of the Indian Government during the summer months. Normally the time taken to cover the 60 miles is eight hours. There are 102 tunnels altogether, with a total length of over five miles, and when the trains are not in them excellent views of the Himalayas are obtained.

The most notable tunnel is at Barog and is 3,752 ft. long. According to local rumour the man who made it went mad. The accompanying photograph shows a train crossing a bridge at Dharampore, a typical structure with tiers of arches.

The engines are mostly 2-6-2 tanks, the heaviest weighing 38½ tons. Rail cars carrying about 12 passengers also are used and complete the journey in two hours.

The line is a branch of the North Western Railway of India.

L. LOWERY (Halton).



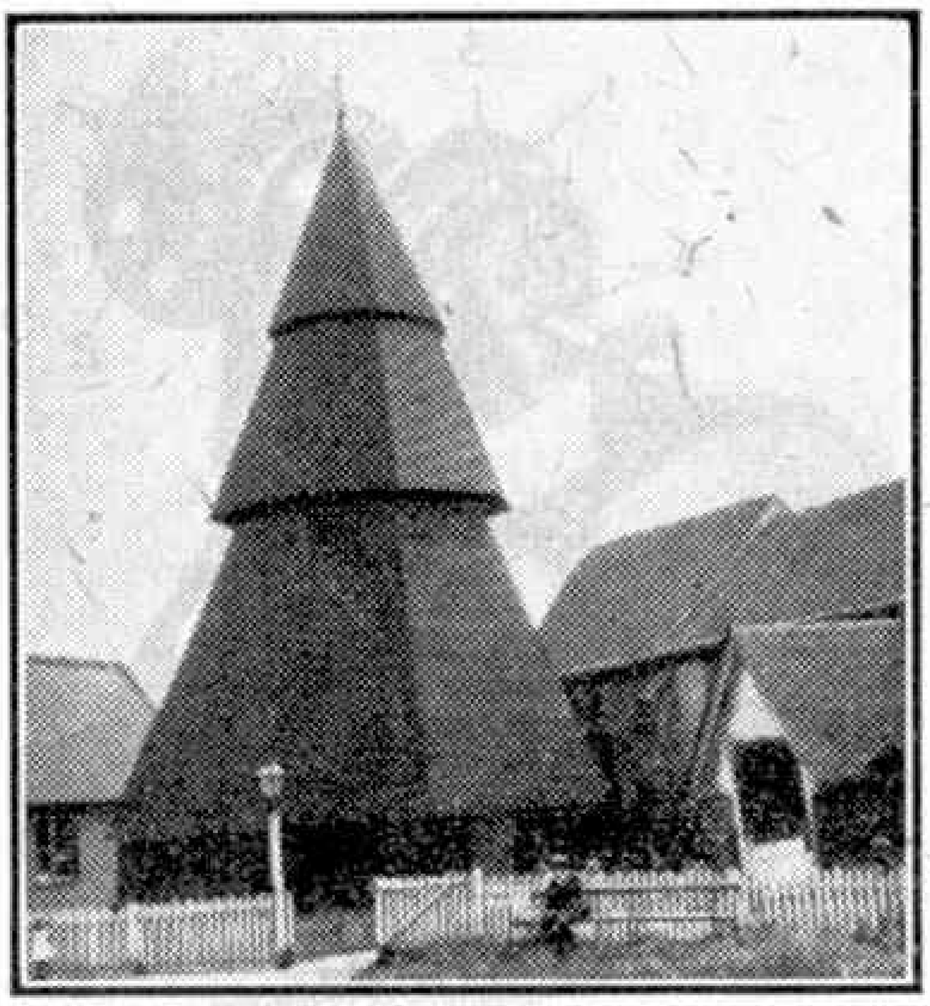
A train on a typical bridge with tiered arches on the Kalka-Simla Railway, India. Photograph by L. Lowery, Halton.

A CHURCH STEEPLE BUILT ON THE GROUND

At Brookland, near Ashford in Kent, there is a church with its steeple built on the ground. The story goes that when the steeple was first planned, there was no material with which to construct it. Later on, when a ship was wrecked on the Kentish coast, timber from the wreck was carted across the marshes, hauled by oxen. Then the builders found that the church was not strong enough to take the weight of the steeple, so they built it on the ground! It contains five bells.

The church, which dates back to about 1300, has one of the finest examples of early Norman fonts in the country, and old-world box pews.

OLIVER BURR
(Tunbridge Wells).



A steeple built on the ground alongside a church. It is at Brookland, Kent. Photograph by O. Burr, Tunbridge Wells.

AUTOMATIC FIRING FOR BOILERS

Readers of the "*M.M.*" may be interested to know something about the automatically stoked boilers which I superintend. The coal, in ½ in. pieces, is fed into a hopper, one of which stands in front of each boiler. From an electric motor a drive is taken through a gear-box with five speeds and neutral to an intermittently revolving worm, which forces the coal along a tube and up into the centre of the fire. A fan supplying forced draught to the centre of the fire also is driven from this gear-box. This can be regulated at the air inlet, and a narrow flexible steel tube branches off the air duct and carries air to the coal tube, injecting it with some force to prevent smoke working back through the hopper.

On the boiler itself there is a thermostat, which can be set at whatever temperature the water is required. It acts by starting up the driving motor when the temperature drops, and stopping it when the water is heated to the thermostatic setting. This is known as "Day Control." By switching over to "Night Control" an electric clock is brought into action. This has only a cam-shaped "hour hand," which raises the end of a glass tube containing mercury to make a contact and start up the motor. The length of the resulting run can be adjusted from about 1 to 15 min. by altering, with a screw mechanism, the angle of the glass tube. Switching over to "Day Control" does not stop the clock.

Included in the gear-box transmission at a convenient point is a pair of soft iron shear pins, which snap if any obstruction, such as a piece of metal, is met with by the worm. This prevents damage to the motor or gear-box. The crusher block at the base of the hopper is then opened, the obstruction is removed, the shear pins are replaced, and everything is ready for work again.

With modern boilers complete control is exercised, not only of the quantity of coal supplied, but also of draught, water feed and other requirements.

FRANK SUTHERAN
(West Hartlepool).

Suggestions Section

By "Spanner"

(680) Friction Free Wheel
("Spanner")

The usual type of free wheel makes use of pawls and ratchets, but in the example shown in Fig. 680 an interesting substitute has been found for this noisy and more cumbersome type of mechanism.

A Coupling 3 is secured to a Rod, which also has a Flanged Wheel 1 mounted freely on it. The Flanged Wheel is spaced away from the Coupling by four Washers, and is attached to a 1" Gear by a Socket Coupling. The 1" Gear meshes with a second similar Gear fixed on a Rod that carries also a 2" Sprocket Wheel.

In each of the end transverse holes of the Coupling is a Threaded Pin, and these are fixed in such a manner that their square shanks are on opposite sides, the flats of the shanks being turned at an angle to the longitudinal axle of the Coupling. Two Collars are free to "float" inside the Flanged Wheel. When the Coupling is turned in one direction the Collars jam between the flange of the Wheel and the inclined edges of the Threaded Pin shanks, thus locking the Flanged Wheel to the rotating Rod. When the Coupling is turned in the opposite direction, the Collars ride idly and the Rod is free to rotate independently of the Flanged Wheel.

In practice a device of this kind has important advantages over the ordinary ratchet and pawl mechanism, as it is quicker and smoother in action and there is less wear and tear. On the other hand a ratchet and pawl mechanism has many uses for which the friction device described here is quite unsuitable.

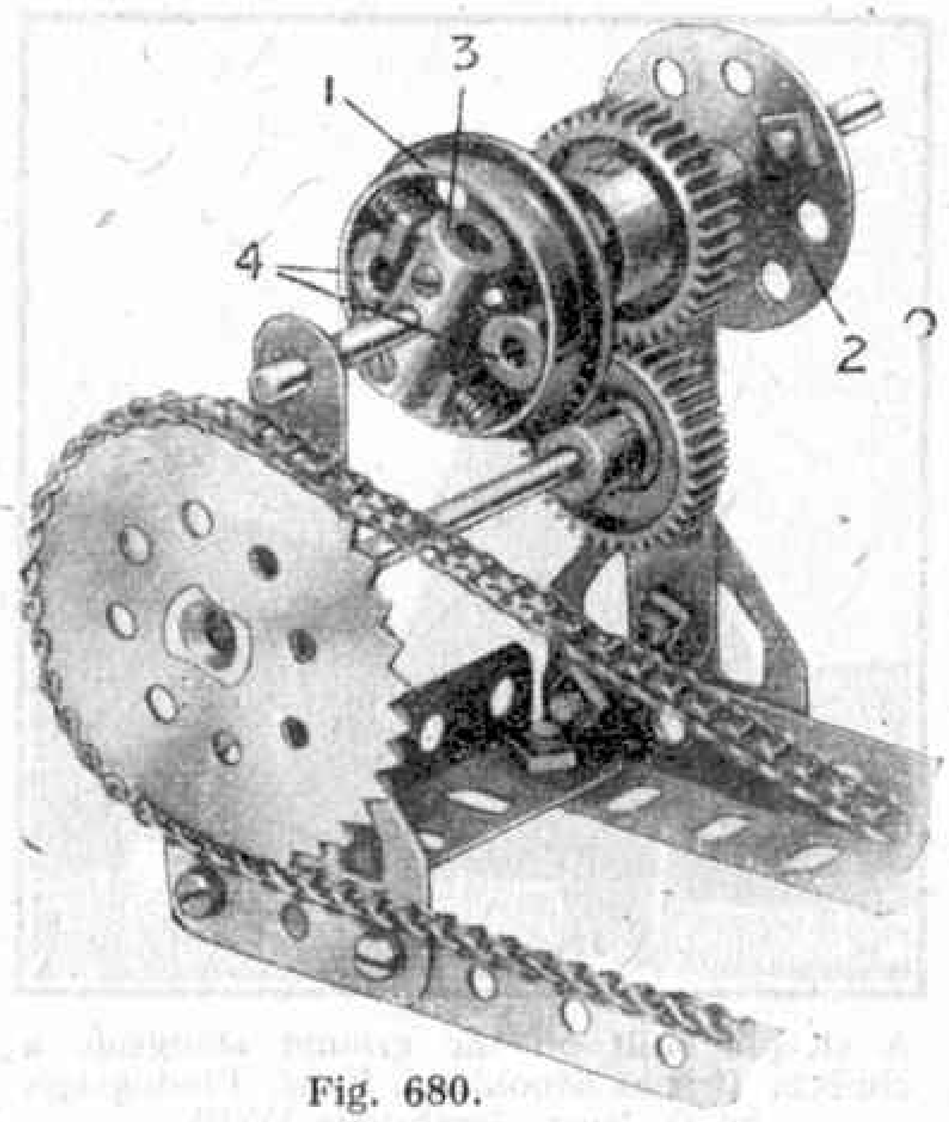


Fig. 680.

(681) A Built-up Universal Coupling
(A. Partridge, Northampton)

Among several interesting items suggested by A. Partridge, is a particularly useful built-up universal coupling shown in Fig. 681. Although an ordinary collar is preferred by Partridge, the device is an excellent example of the value of the Aeroplane Collar (Part No. P.52) to model-builders who like experimenting and devising unorthodox methods of construction. Two or three of these Collars should be in the possession of every keen model-builder, as their small size is sometimes of great assistance in constructing a compact mechanism. In the universal coupling designed by Partridge the small size of the Aeroplane Collar 1 allows it to be accommodated with more freedom of movement between the Bolts that fix together the two Double Brackets 2. The latter are lock-nutted together on $\frac{3}{8}$" Bolts, which pivot freely in $\frac{1}{2}$" × $\frac{1}{2}$" Angle Brackets 3 bent as shown and fixed to a Bush Wheel 4.

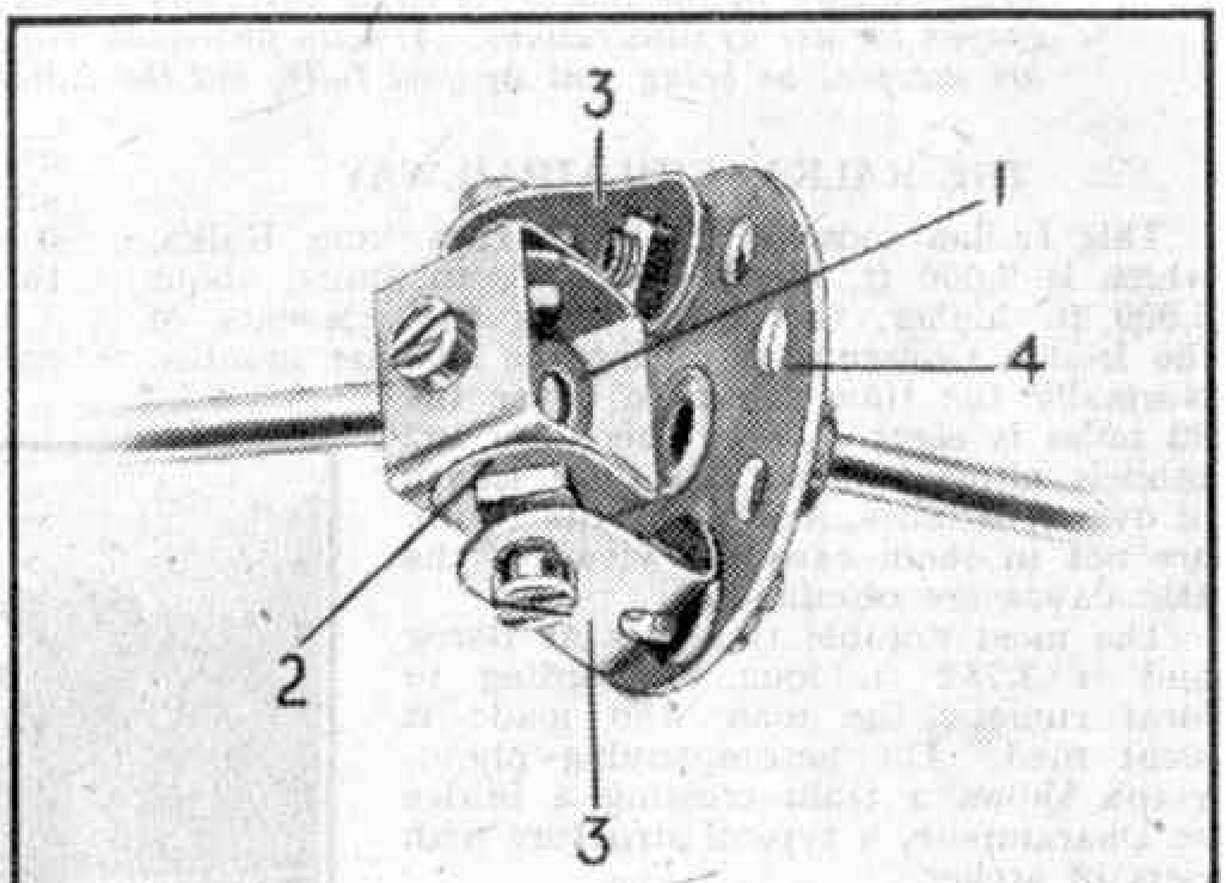


Fig. 681.

(682) Tension Springing for Road Wheels
(E. Miller, Preston)

The device shown in Fig. 682 provides an interesting alternative to the usual type of rear axle suspension, and with little or no

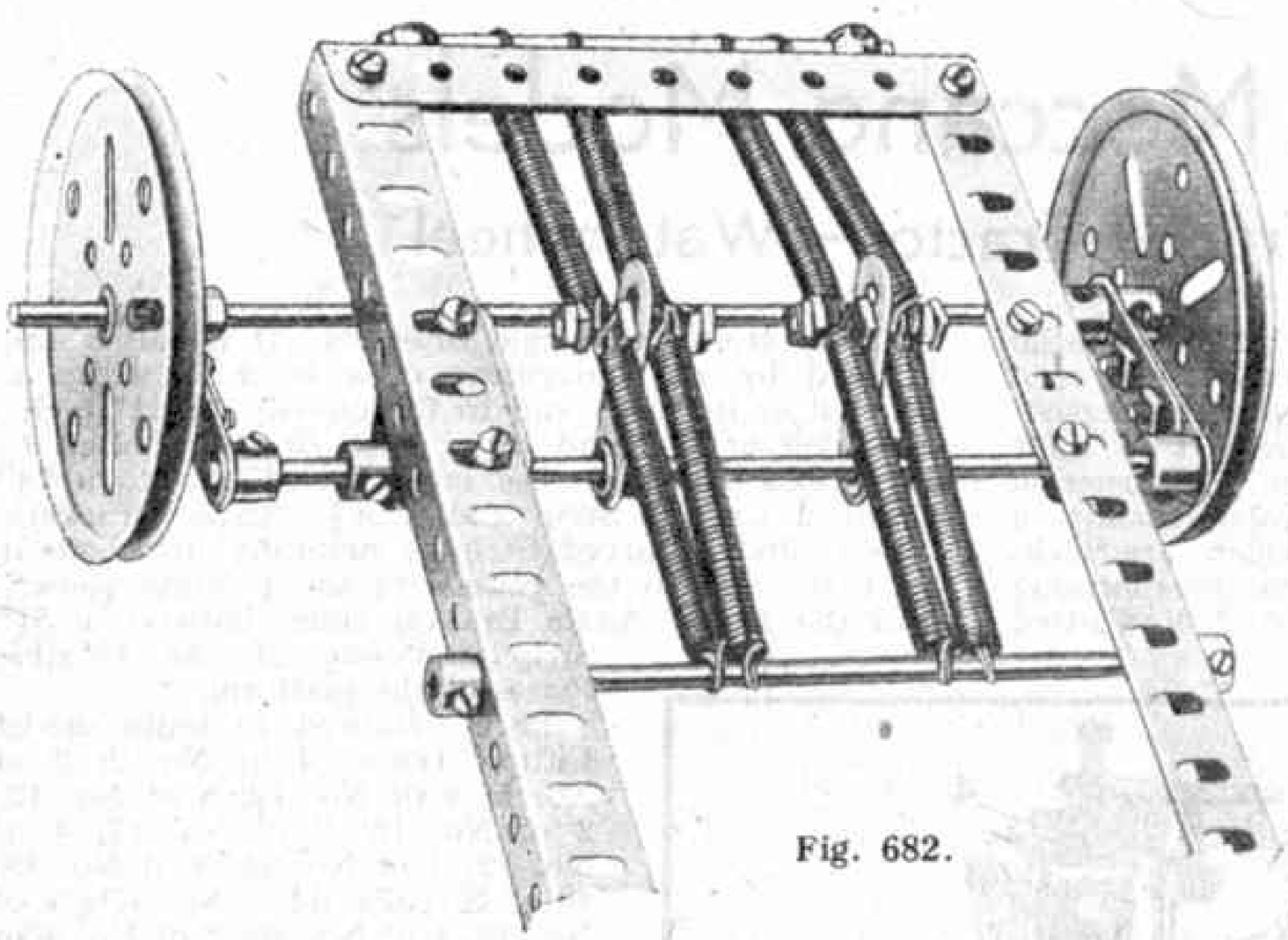


Fig. 682.

alteration from the construction shown can be fitted into any Meccano motor chassis. The Rod carrying the road wheels is supported so as to revolve freely in the bosses of two Cranks, which in turn are bolted to two further Cranks secured to the ends of a Rod. The latter Rod is mounted in Trunnions bolted to the underside of the side girders of the chassis, and has two further Cranks secured to it. Four Springs are attached to these Cranks by 1" Screwed Rods, two pairs of the Springs being held on a Rod mounted between the side girders of the frame while the other two pairs are anchored to the rear end of the chassis.

(683) Useful Built-up Roller Bearing

(M. Hewitt, Glasgow)

It is often found necessary to support a very heavy load on an exceptionally small area so that it will rotate easily, and in such models as ship cantilever cranes and slipway derricks, where space is limited, this is a difficult problem. One way of overcoming it is shown in Fig. 683, where a neat roller unit is illustrated. The spider frame 2 consists of four 2½" small radius Curved Strips bolted together to form a circle, and the rollers are eight ½" fast Pulleys. The Pulleys are mounted on Pivot Bolts inserted in the transverse holes of eight Threaded Bosses fixed to the circular frame by means of ⅜" Bolts. Two Washers are placed between each Threaded Boss and the frame. The grub-screws of the ½" Pulleys are removed to permit free rotation of the wheels, and the Pivot Bolts are screwed into the Threaded Bosses until they grip the shanks of the Bolts used to fix them in place.

The movable guide rail consists of a Wheel Flange placed with its flat side against the corresponding flat side of a further Wheel Flange held by four ½" Bolts to the superstructure.

A vertical Rod 8 held in the boss of the Gear Wheel 4, forms the axis of the model. The spider frame is first placed over this Rod so that the Pulleys rest upon the up-turned flange of the fixed guide rail. The superstructure is then passed over the Rod so that the Wheel Flange 3 rests upon the Pulleys of the roller race, which thus support the entire weight of the rotating section of the model. A Bush Wheel 9 bolted to the superstructure serves as a reinforced bearing for the Rod 8, and a Collar and set-screw 10 hold the complete assembly together.

The vertical Rod 11 and ½" Pinion 12 form a good method whereby the superstructure may be rotated about the Rod 8. The Rod 11 is driven by a Motor, and the ½" Pinion is in constant engagement with the Gear Wheel 4, and as the latter is fixed to the base, rotation of the Rod 11 causes the Pinion to travel round the Gear Wheel, so moving the superstructure. The driving Rod 11 can be extended as necessary.

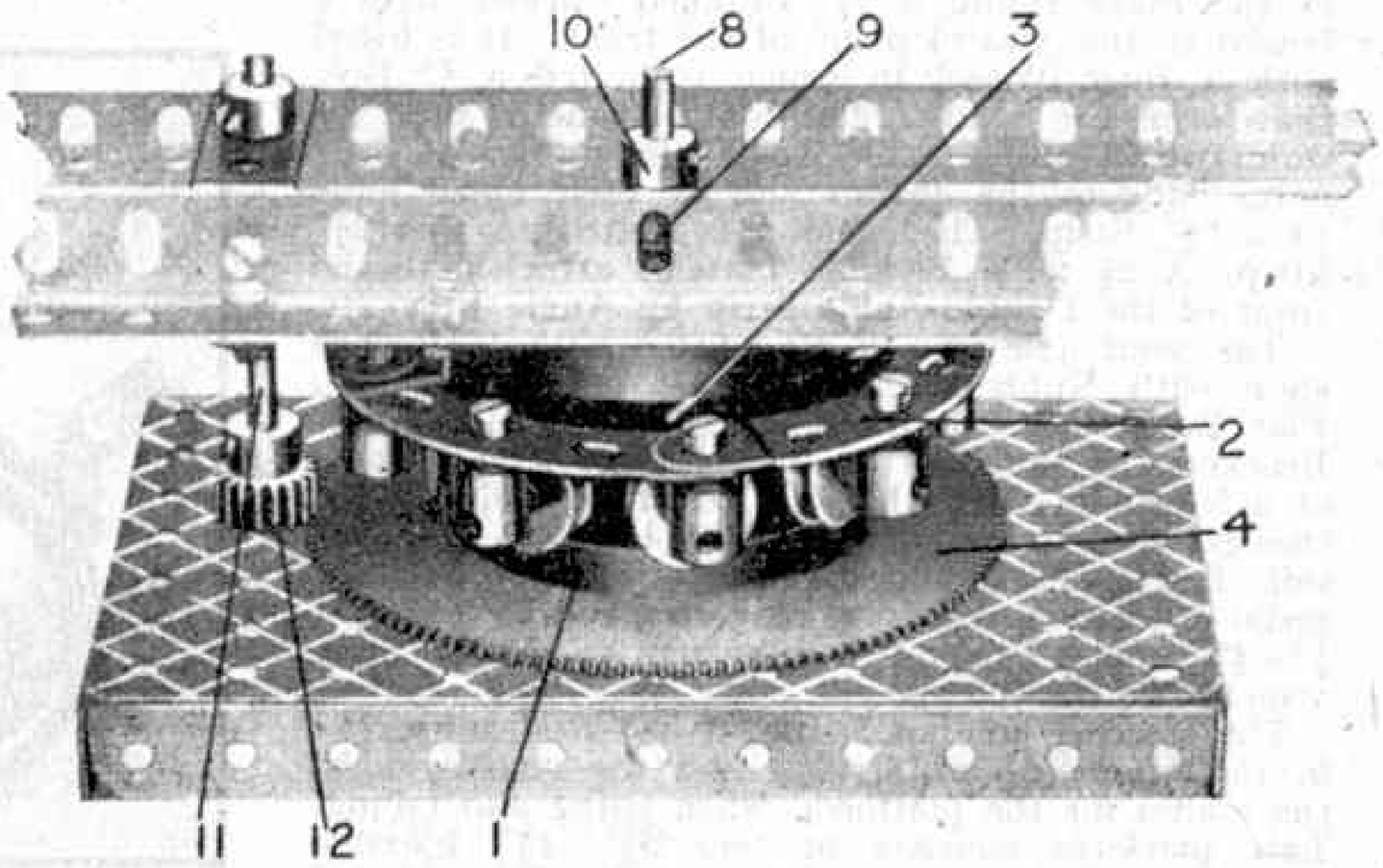


Fig. 683.

New Meccano Models

Lifting Truck—Tractor—Waterwheel

THE neat truck shown in Fig. 1 has all the essential movements of a modern commercial truck used in factories for transporting goods from one department to another during manufacture. It is built from parts contained in Outfit No. 2. Construction is begun with the chassis, which consists mainly of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 1, to which are lock-nutted, by means of a $\frac{3}{8}''$ Bolt, two Trunnions forming the rear bogie. The Trunnions carry a 2" Rod fitted

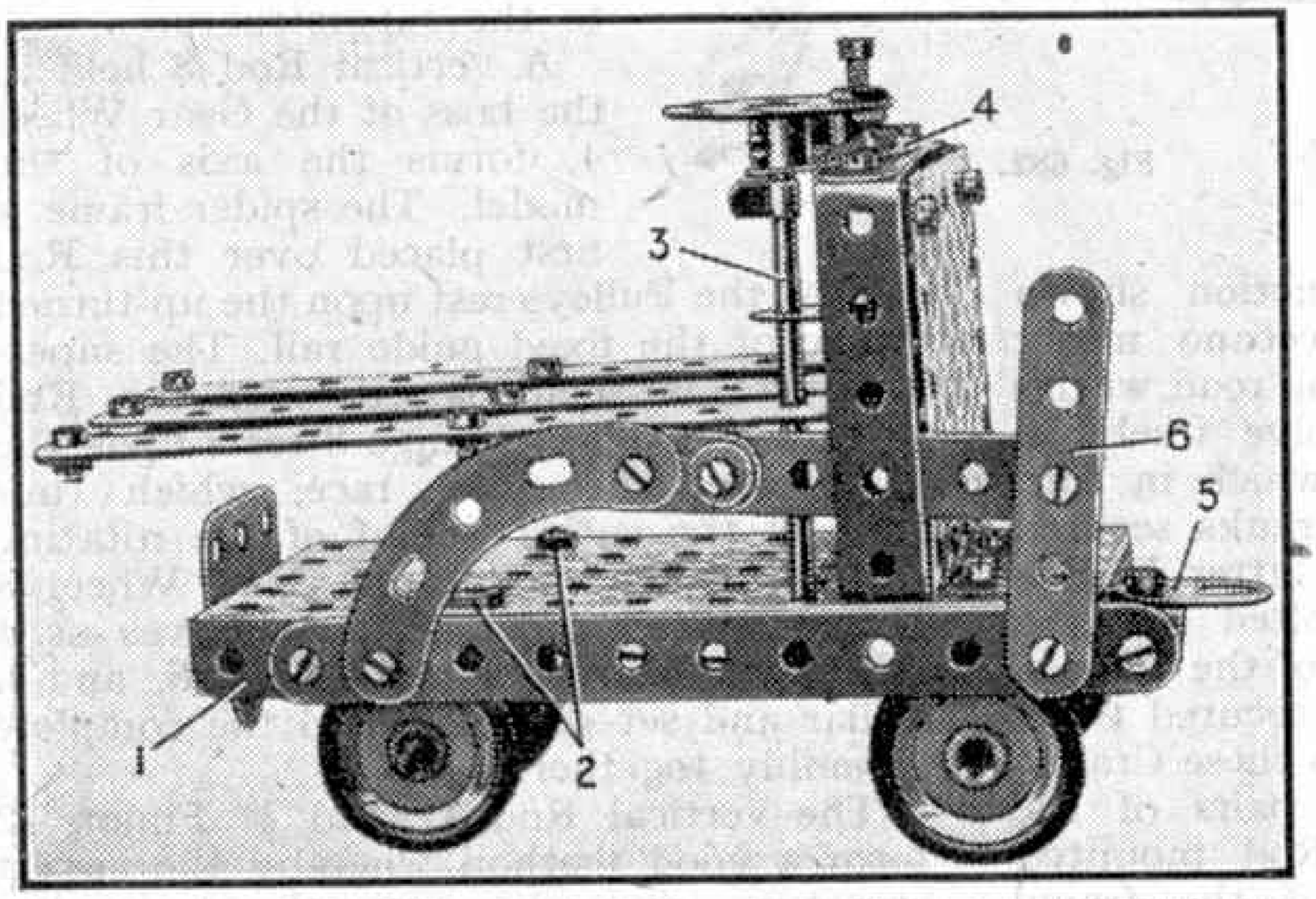


Fig. 1. A workable lifting truck that can be built from parts in Meccano Outfit No. 2.

with two 1" Pulleys shod with Rubber Rings. The front wheels are steered by a short length of Cord fastened at both ends to the Trunnions and attached centrally to a Cord Anchoring Spring fixed on the lower end of the steering column. Full movement of the steering wheels is obtained by guiding the Cord around two $\frac{3}{8}''$ Bolts fixed to the Plate 1 by nuts 2.

The steering column 3 is $3\frac{1}{2}''$ long, and is journalled in the Plate 1 and a $2\frac{1}{2}''$ Cranked Curved Strip 4 bolted to the control panel of the truck. It is fitted with a Bush Wheel to which is bolted a $\frac{3}{8}''$ Bolt that forms the handle. The control panel is built up from two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips fixed at their lower ends to the chassis and at their upper ends to a $2\frac{1}{2}''$ Strip. The Strip 4 is bolted to this $2\frac{1}{2}''$ Strip. A $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate is attached to the front of the Double Angle Strip by Angle Brackets.

The front axle is a 2" Rod fitted with 1" Pulleys shod with Rubber Rings, and it is journalled in Flat Brackets fixed in the chassis by $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets. A brake fitted to the front axle consists of a length of Cord that is tied at one end to the chassis, then passed around the boss of the near side front wheel, and finally fastened to a foot pedal 5. The pedal is a Flat Bracket bolted to a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket lock-nutted to a $5\frac{1}{2}''$ Strip attached to the chassis.

The steering column 3, and a $3\frac{1}{2}''$ Rod supported in the other end of Strip 4 and the chassis, form the guides for the platform, when rising and falling. This platform consists of two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates joined together and braced by $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips. It is kept horizontal by bolting to its front end a $\frac{1}{2}''$ Reversed Angle Bracket and a similar part built up from two Angle Brackets. It is raised and lowered by the movement of a lever 6, which is pivoted at its lower end to the chassis. A $2\frac{1}{2}''$ Strip, extended at one end by a Flat Bracket bolted to it, is lock-nutted to the lever 6 and also to a $2\frac{1}{2}''$ Cranked Curved Strip and $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets. The Cranked Curved Strip is pivotally attached at its other end to the chassis in the position shown, and the $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket slides between a $5\frac{1}{2}''$ Strip and one of the Flexible Plates of the platform.

Parts required to build model Lifting Truck: 4 of No. 2; 2 of No. 5; 4 of No. 10; 8 of No. 12; 2 of No. 16; 2 of No. 17; 4 of No. 22; 1 of No. 24; 3 of No. 35; 40 of No. 37a; 32 of No. 37b; 4 of No. 38; 1 of No. 40; 2 of No. 40a; 1 of No. 52; 2 of No. 90a; 4 of No. 111c; 1 of No. 125; 2 of No. 126; 1 of No. 126a; 4 of No. 155a; 1 of No. 176; 2 of No. 189; 1 of No. 190.

Fig. 2 shows a very simple and easily built model of a road traction engine. The bunker and cab of this consist of a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate 1 bolted to the flanges of two $1\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates that form the sides. The rear end consists of a Flexible Plate bolted to the Flanged Plates and slightly bent as shown at its upper end. The two Road Wheels are mounted on a 3" Rod that carries also a $\frac{1}{2}''$ fast Pulley inside the bunker. The flywheel 2, a $1\frac{1}{2}''$ Pulley Wheel, and the Flanged Wheel 3 are mounted on an Axle Rod journalled in a Double Angle Strip bolted to the Flat Plate.

The $2\frac{1}{2}''$ Cylinder forming the boiler is capped at its front end with a $1\frac{1}{8}''$ Flanged Wheel, and the entire unit is fixed to the Flat Plate of the bunker by means of a Threaded Rod, which is passed through the Plate, the centre of the Cylinder, and the Flanged Wheel. A Worm 4 represents the cylinder of the engine. The front road wheels are fixed on a Rod

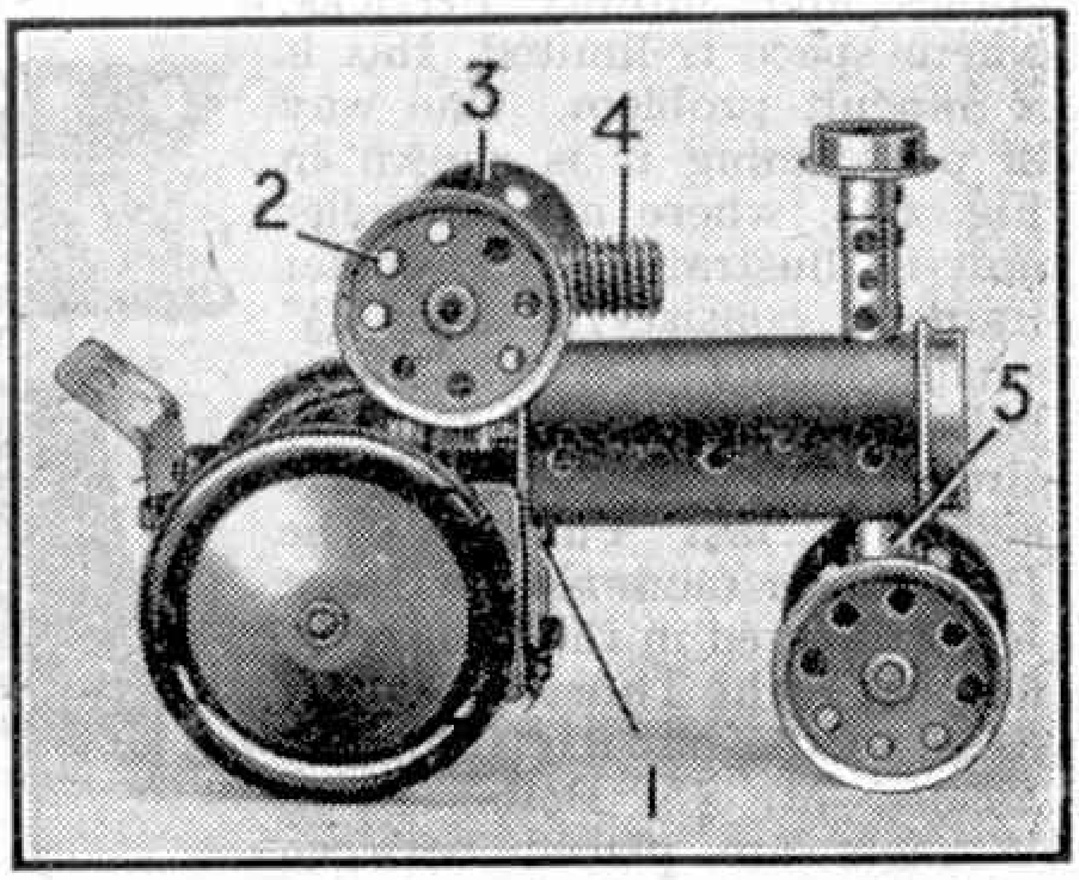


Fig. 2. A "simplicity" model of a steam traction engine.

journalled in the arms of a large Fork Piece, which is pivoted on a ¾" Bolt to the underside of the boiler.

A Coupling and a ¾" Flanged Wheel represent the chimney and are fixed in place by means of a short Threaded Rod. If a Driving Band is passed around the ½" fast Pulley on the rear axle and also around the Rod of the flywheel 2, the latter will rotate when the model is pushed along the ground.

Parts required to build model miniature Traction Engine: 2 of No. 16b; 1 of No. 18a; 1 of No. 20; 1 of No. 20b; 3 of No. 21; 2 of No. 23a; 1 of No. 24; 1 of No. 32; 10 of No. 37a; 11 of No. 37b; 1 of No. 48a; 2 of No. 51; 1 of No. 63; 1 of No. 72; 2 of No. 80c; 1 of No. 111; 1 of No. 116; 1 of No. 186; 2 of No. 187; 1 of No. 188.

Fig. 3 shows a working model of a manually-operated waterwheel, of a type that is sometimes used in Eastern countries for raising water from shallow wells and rivers. It will actually raise water from a container housed in its base, and discharge it into a tin or other vessel placed at ground level. Alternatively, sand may be used to show the working of the wheel.

Construction is begun with the base and the support for the wheel. Two 7½" Angle Girders are spaced apart at each end by 5½" Angle Girders, and to the edge of one of these are bolted two 3½" × 2½" Flexible Plates 1 so that a gap ½" wide is left between them. The other 7½" Angle Girder is braced by 1" Corner Brackets. The Plates 1 are fixed also to the base by another 7½" Angle Girder 2 and 1" Corner Brackets, and represent the ground level. The lower half of the wheel would be underground in the actual machine. Four 5½" × 2½" Flat Plates and two 3½" × 2½" Flexible Plates are bolted around the base and these are secured to 7½", 5½" and 3½" Angle Girders.

The waterwheel is a Hub Disc, to the rim of which are bolted eight Flat Brackets 3. The Hub Disc has a Bush Wheel fixed to it centrally on one side, and on the other is bolted a Double Bent Strip. The wheel is mounted on a 4" Rod 4, which runs in bearings provided by one of the Flat Plates of the base and a 1" Corner Bracket bolted to the Angle Girder 2. Four Dredger Buckets 5, the clips of which are removed, are attached to 1" × ½" Angle Brackets bolted equidistantly in the positions shown to the face of the Hub Disc. As the Dredger Buckets are arranged in this position, the water carried up in them as the wheel rotates is delivered into a small container 6, which may be made from thin tinplate and secured to the model by ½" × ½" Angle Brackets.

The Flat Brackets 3 fixed to the waterwheel engage four 2" Rods that are held by Collars in the corresponding holes of two 4" Circular Plates. These Plates carry Bush Wheels at their centres and are mounted on a 5½" Rod 7. This Rod is journalled in a 2½" Triangular Plate bolted to the Angle Girder 2, and also in a 9½" Angle Girder and a Double Arm Crank that is fixed to it. The 9½" Angle Girder is attached by means of 7½" Angle Girders to the base of the model, and is braced by Architraves.

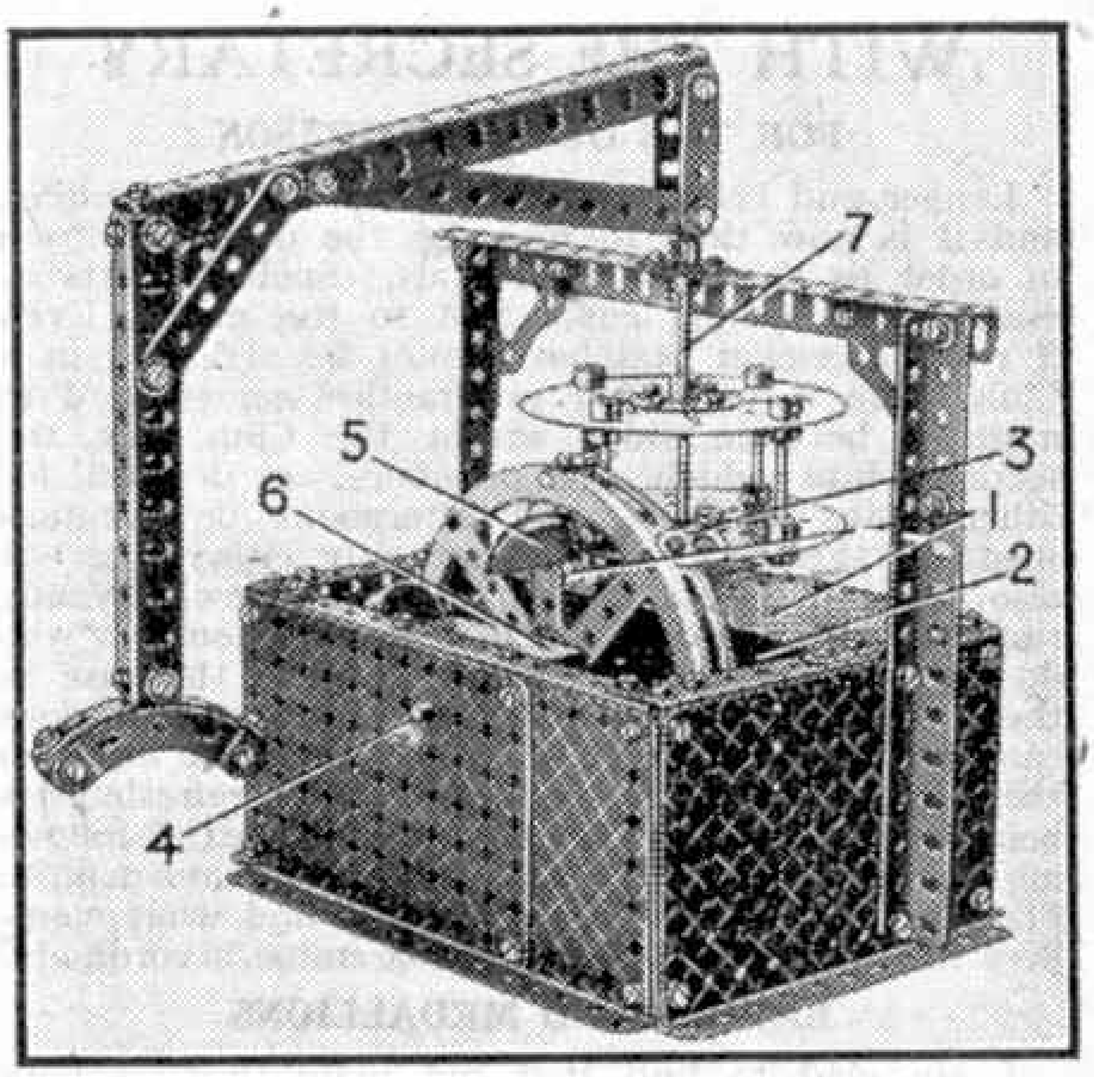


Fig. 3. A model of a Moroccan waterwheel used for raising water from shallow wells and rivers.

The Rod 7, which rotates the waterwheel is driven by means of an arm constructed as shown in the illustration and attached to the upper end of the Rod by two Collars. In the actual device an ox or a donkey is harnessed to a yoke on this arm and drives the wheel by walking round and round the well.

Parts required to build Waterwheel: 2 of No. 2; 2 of No. 4; 1 of No. 8; 1 of No. 8a; 9 of No. 8b; 6 of No. 9; 4 of No. 9b; 1 of No. 9c; 8 of No. 10; 3 of No. 11; 2 of No. 12; 4 of No. 12b; 1 of No. 14; 1 of No. 15b; 4 of No. 17; 3 of No. 24; 110 of No. 37; 31 of No. 38; 1 of No. 45; 4 of No. 52a; 22 of No. 59; 1 of No. 62b; 1 of No. 76; 2 of No. 90a; 2 of No. 108; 1 of No. 118; 4 of No. 131; 5 of No. 133a; 2 of No. 145a; 4 of No. 190; 1 of No. 215.

A Fine Competition for all Meccano Boys

Have you ever won a prize in a Model-building Contest? If you have, why not win another? If you have not, there is all the more reason why you should enter the contest announced here, for there is every possibility that you may win one of the fine prizes offered. All you have to do is to build a Meccano model entirely from your own ideas. This may be of any type, and the only condition is that it must be your own unaided work. You are eligible to compete in this contest no matter what age you may be, and as entries will be accepted up to 30th April, there is ample time in which to find an interesting and original subject and then build it in Meccano.

Any size of Outfit may be used in building models, but good workmanship and constructional details that show ingenious uses for Meccano parts will attract the attention of the judges far more than the mere size of a model.

After the model is built the next job is to obtain a suitable illustration of it. This may be either a photograph or a sketch. Write your age, name and address on the back of the illustration and enclose it, together with a brief description of its operation and construction, in an envelope addressed "*March General Model-building Contest, Meccano Ltd., Binns Road, Liverpool 13.*"

Entries will be grouped into one section, but a competitor's age will be taken into consideration when assessing the merits of his work.

The prizes to be awarded for the best built and most interesting models received are: First, £2/2/–; 2nd, £1/1/–; 3rd, 10/6. There will be also consolation prizes of 5/– each for entries of merit that do not gain a major award.

It should be noted that successful entries become the property of Meccano Ltd., but photographs or sketches of unsuccessful models will be returned to senders provided that a stamped addressed envelope of the necessary size is enclosed with the entry for that purpose.

The closing date for entries is 30th April, but entries should be posted as soon as they are ready and not kept until the closing date approaches. All prize-winners will be notified by letter, and a full list of the awards, together with illustrations of some of the best models, will be published in the "*M.M.*" as soon as possible after the closing date.

Club and Branch News

WITH THE SECRETARY

FOR THE OUTDOOR SEASON

Longer and brighter days are rapidly approaching, and it is now time to plan for the outdoor season in order to ensure a good start. Such pursuits as cricket and cycling come first to the mind. Even if regular cricket matches cannot be arranged in a Club there is good fun in practice games, and in matches between sides within the Club, say the sections into which the members are formed for other Club activities, and afternoons or evenings spent in this way will be not only enjoyable, but also profitable from a Club point of view. Cycling runs too are splendid, and if there are members who do not possess bicycles, which may be the case in these days of shortages, walks and bus excursions can take their place. It is a good scheme to combine the two, some rallying point for tea or refreshments being reached by cycling and walking parties following different routes. The great thing is to have definite plans made, and now is the time to find what members like and to arrange the programme accordingly.

BADGES AND MEDALLIONS

I am glad to find that my inability to supply Guild or H.R.C. badges has not hindered recruiting. Until these badges can be made I am enrolling all members free, sending them their certificates immediately on receiving their application forms. Now the stock of Recruiting Medallions too is exhausted, and I cannot say when it will again be possible to obtain them. I am sure that this will not deter members from bringing in their friends who have the necessary qualifications, and I am keeping records of the recruiting successes of members so that Recruiting Medallions can be supplied later. Those who already have medallions, and have gone on to recruit additional members, can still forward their medallions to be engraved with their names and the words "*Special Award*" on reaching the necessary total.

As soon as it is possible to supply any of these badges I will include an announcement on this page. Then members who require Guild and H.R.C. badges will be able to forward the usual remittances and obtain them, and Recruiting Medallions will be sent out to those who have earned them.

This brings me to the remaining award, the highest in the Guild, the Merit Medallion. I can still supply this, and I particularly want leaders of Clubs to send me their nominations. In each Club two medallions are awarded for each session, and now is the time to consider which members should be made the recipients for the present session.

This does not apply to overseas Clubs at the moment, but I hope Leaders of these will let me know of any instances in which outstanding work of any kind has been carried out. An instance of this has just come to my notice from South Australia, where the Thebarton Boys' Technical School M.C. has continued with a splendid programme, a summary of which was included in "*Club Notes*" of last month's "*M.M.*" In a recent letter Mr. Gibson, Leader, told me of the good work that has been done by Terry Hearn, who is President of the Club and has filled various official positions during his four years of membership. Mr. Gibson tells me that he would have recommended Terry for the Merit Medallion if this award had still been available, and if he is still at school when the award becomes possible in the case of his Club I shall be glad to include him among the winners of the Merit Medallion.

PROPOSED CLUBS

WEST THURROCK—Mr. I. Ellard, 6, Pellings Villas, London Road, West Thurrock, Essex.
WEYBOURNE—Mr. A. Norris, Wiseton Cottage, Weybourne, Farnham, Surrey.

PROPOSED BRANCHES

BECKENHAM—Mr. J. R. Perry, "Acacia Villa," 82, Barnmead Road, Beckenham, Kent.
EAST BARNET—Mr. A. M. Loader, 12 Stuart Road, East Barnet, Herts.
BOURNEMOUTH—Mr. I. Humphrey-Davy, The Red House, Alumhurst Road, Bournemouth, W.
KENDAL—Mr. I. R. Clough, "Rosemont," 92, Burnside Road, Kendal, Westmorland.
WIDNES—Mr. T. Jones, 291, Ditchfield Road, Hough Green, Widnes, Lancs.

RECENTLY INCORPORATED BRANCHES

471. LARGS—W. Kidd, 22, Barr Crescent, Largs, Ayrshire.
472. 1ST PORTLAND—Mr. W. Collings, "Ormond," 8, Ventnor Road, Portland, Dorset.

CLUB NOTES

NAVENBY M.C.—The programme has included a Camp Fire, Morse practice, Games and a Treasure Hunt in addition to the usual Model-Building Evenings. The Club room also has been decorated and a Library has been started. The rules have been revised, a new one ensuring that recruits serve a probationary period of one session. Club roll: 7. *Secretary:* P. I. Addison, High Street, Navenby, Lincs.

HORNSEA M.C.—Interesting Lectures continue to form a useful part of the programme, with Lantern Lectures, Film Shows and useful hobbies. At one meeting an electric bell was installed. The Club's Hornby Railway has been laid down, four tracks being in use and each member conducting operations on all tracks in turn. Games also have been played. Club roll: 45. *Secretary:* P. Hobson, 1A, Marlborough Avenue, Hornsea.

AUSTRALIA

MELBOURNE M.C.—Film Shows have formed a special feature at Club meetings, subjects including the story of the Baltimore and Ohio Railroad, welding in industry and the story of transport. A film that was greatly enjoyed showed how the Handley-Page "Halifax" is built, and in connection with this a Meccano aerial bombing model was constructed. Excellent operations have been carried out on the Club's Hornby Railway, the programme including a special holiday timetable. Club roll: 12. *Secretary:* L. Ison, 8, Hayes Street, Northcote, N.16, Victoria, Australia.

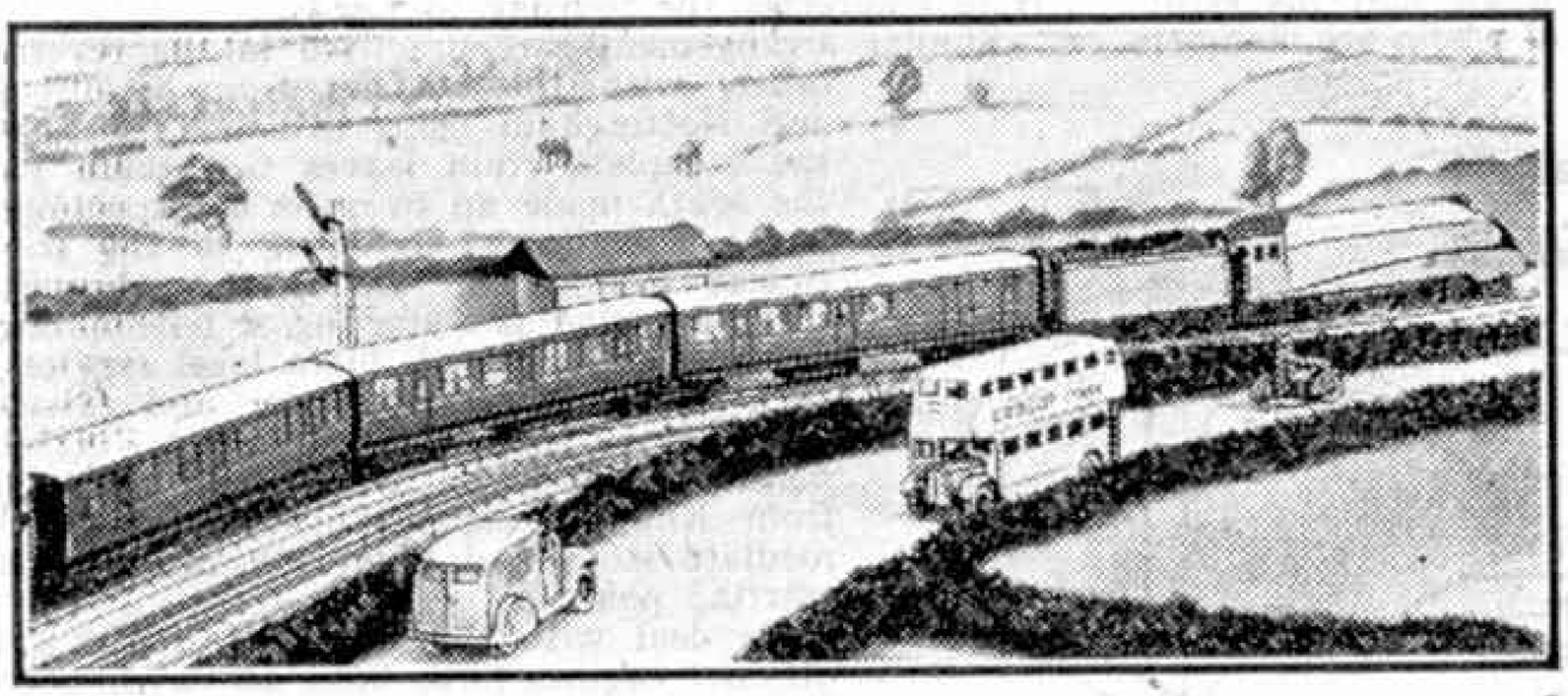
BRANCH NEWS

WAVERLEY (SALFORD)—An excellent layout provides interesting operations. A goods depot, with two platforms and a cattle dock, has been constructed. Film Shows have been given. A Model Aircraft Construction Contest has been arranged, and an aircraft recognition class has been started. *Secretary:* P. Barlow, Waverley Hotel, Eccles New Road, Salford 5.

HORLEY—Appointments of members as signalmen, etc. have been made, and good concerted work on the Branch layout has resulted. Trains are run to timetable, and at one meeting blackout conditions were imposed, the only lights allowed being torches at stations and mainline points. *Secretary:* K. C. Hill, "Etretat," Balcombe Road Horley.

On the Lineside of a Hornby-Dublo Railway

WITH the effort nowadays of keeping traffic on the move on most miniature railways we are apt to overlook somewhat the various lineside features that make so much difference to the appearance of a layout. Those who have any of the standard accessories are very fortunate; but for the most part, as new material is not available, it is necessary to fix up at home somehow the various items that are required to be added to the mere track essential for running purposes.



A Hornby-Dublo express in natural surroundings.

A station is one of our first and most important "wants." Otherwise our trains have nowhere to start from and nowhere to stop! Simple structures can, however, be made up with the aid of our old friends wood and cardboard. Many model railway engineers no doubt will have become adept in the use of these materials during recent times. Often it is possible to make use of certain parts of the constructional "cut-out" books that can be seen in various stores from time to time.

Other items salvaged from the "toy-box" can sometimes be adapted with satisfactory results. We recently saw a Dublo system on which one station consisted of the building portion of an old MO Station mounted on a home-built wooden platform made the correct height and length for Dublo trains. The general effect was quite pleasing. Close by, too, was an MO Signal Cabin, a relic of earlier days, but certainly better than no cabin at all. Even where such treasures cannot be unearthed, it is not very difficult to draw out and colour similar models, and once we start there is no telling what developments may take place.

Much depends on whether our railway is permanent, or has to be put away when running is finished. Even if the latter is the case we can make quite a few buildings of different kinds with which to border our railway. Very often cardboard boxes, though these are rare nowadays, can be used as the basis of various structures, and we can even adapt them to form part of a road overbridge or a short tunnel. There is a great fascination in seeing the trains pass under a bridge or tunnel and the better we make our model the more realistic the effect will be.

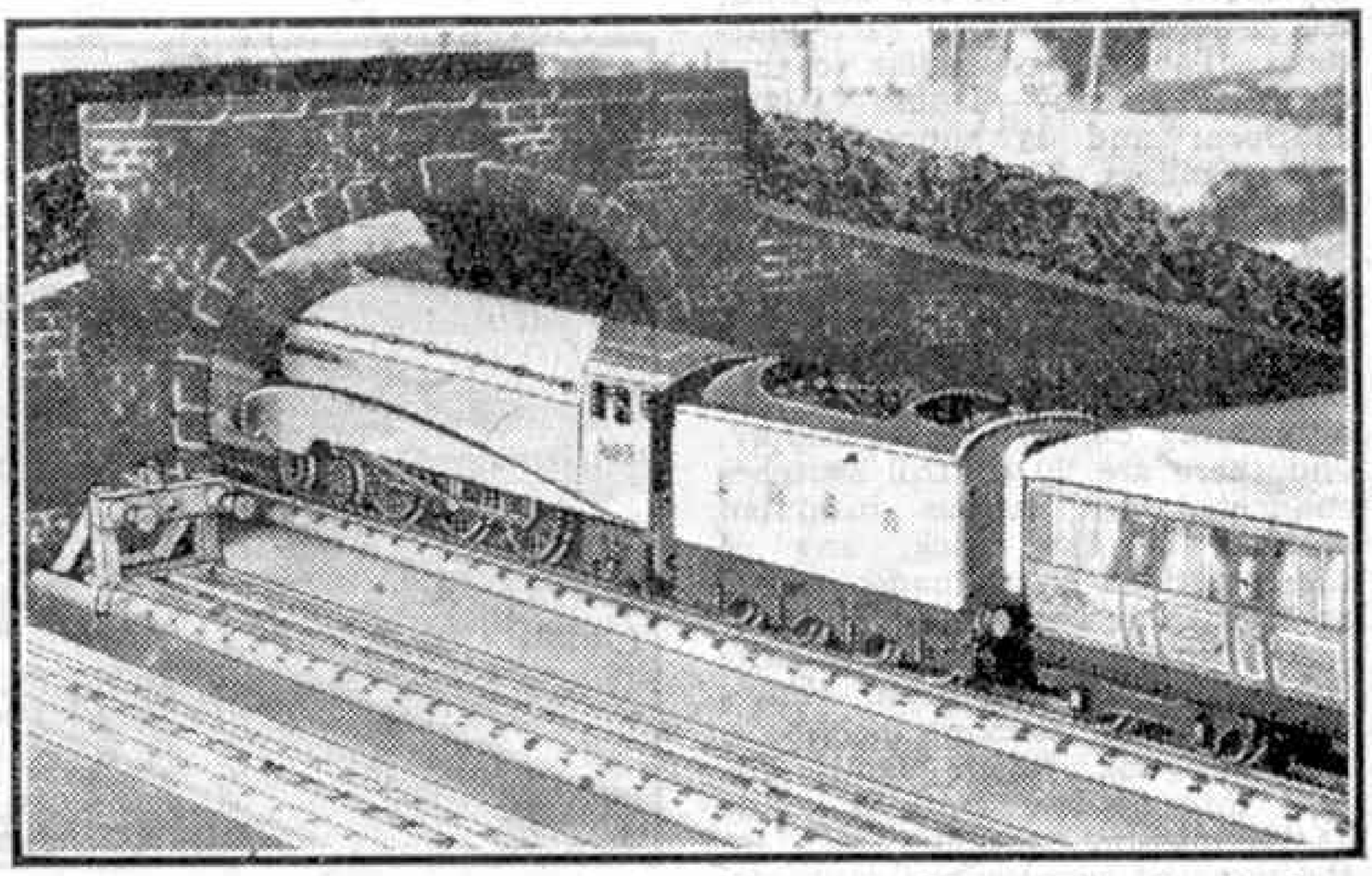
For many of the less commonly modelled items "Plasticine" is a great help, and readers who require a few suggestions should look up the articles in these pages in the April and September issues of the "*M.M.*" last year. These dealt with such interesting features as water tanks and lineside huts, and there is no reason why this most adaptable material should not be used for a greater variety of items along the line.

Lineside fencing is rather a problem, but we can always fix up walls from strips of card roughly painted and marked irregularly to represent stone. The top edge of the card should not be dead level; a few "ups" and "downs" when we are cutting out will help the effect very much. Fencing can be done in a similar manner, the details depending on the exact kind of fence we are modelling. Post-and-rail fencing can be made by glueing together strips of card cut to the required lengths for posts and rails respectively.

Miniature pavements for use outside our station, or in front of any "houses" we may make, can be cut out of card and painted or otherwise finished to give the effect we require. Even if they have to be restricted to the "town" area they will help considerably in improving the more or less bare state of the model "ground."

Motor vehicles for the roads or merely for placing in the goods yard can be made at home. We have seen some quite good examples of these from time to time, and even if the wheels don't turn it does not matter much! Alternatively, constructional sets for various vehicles are on the market, and readers should keep an eye on the advertisements in the "*M.M.*" for items of this kind. The famous Dinky Toys vehicles are of course now unobtainable.

Stations and other buildings require posters and advertisements. Suitable cuttings can often be got from magazines, papers and timetables, while labels, wrappers and cartons of different kinds can often be trimmed to provide quite respectable little posters. Special boards or hoardings are not difficult to arrange.



"Whoof!" Under the bridge dashes the streamliner at the head of an L.N.E.R. express.

A Hornby Layout in Vancouver

Further Developments on an L.N.E.R. System

READERS will no doubt recall the miniature L.N.E.R. Hornby layout that we described in these pages in April 1944. We have now received the following notes on the latest developments on this railway, which is operated by Mr. G. Eagle and his eight-year-old grandson Bobby, both of whom are members of the Hornby Railway Company. The general operating scheme of the line is still the same, being based chiefly on the L.N.E.R. King's Cross and Leeds services, but the layout has been expanded considerably.

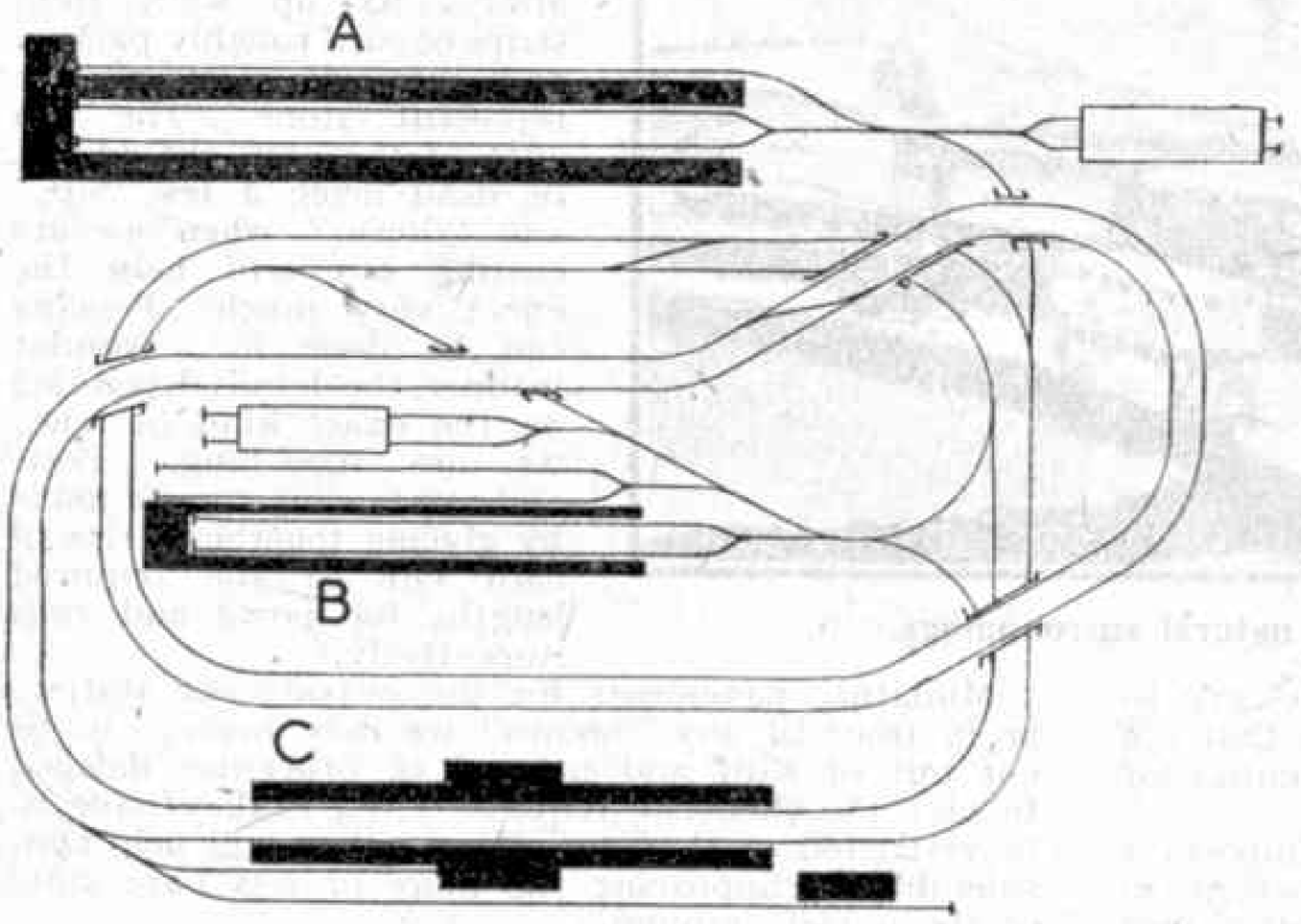


Diagram of the latest development of the layout of Mr. G. Eagle, Vancouver, that is described on this page.

There are now two terminal stations, usually representing King's Cross and Leeds respectively, and a through station which changes its identity as required according to the operating needs of the moment. The miniature "King's Cross" is quite an imposing terminus represented in the accompanying diagram at "B." It is designed on similar lines to the Hornby Dublo City Station, "Leeds Central," indicated by "A" in the diagram, has a separate roof to each platform. The roof is similar to that of the Hornby Dublo Island Platform and is supported by central pillars. The passing station is made up of the original Hornby No. 4E Station to which various home-made additions have been provided.

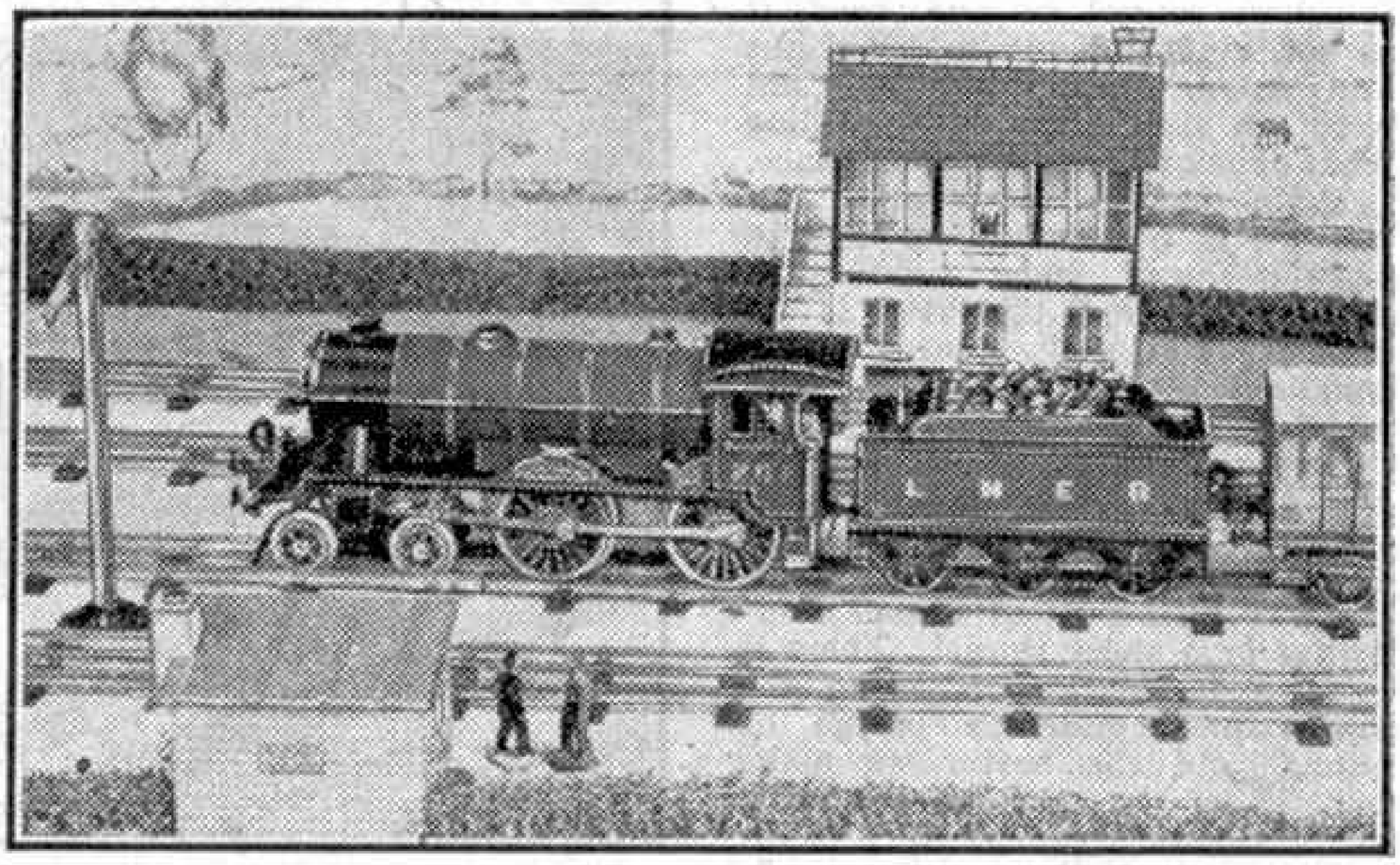
Power is obtained through Meccano Transformers from the alternating current mains supply, and there are 20 control switches connected to various insulated sections of the track, any of these sections being made "alive" or "dead" as required.

A typical operation is the working of a train from King's Cross carrying sections for Leeds, Bradford and Nottingham. The first intermediate stop is made at the passing station, which for the moment represents Grantham. Here, making full use of the isolating arrangements, engines are changed and the Nottingham coaches are detached. Similarly, after further circuits of the main line, the Bradford vehicles are detached, the passing station now representing Wakefield; then the rest of the train completes the journey to Leeds.

Similar arrangements are practised in the reverse order, with the coaches from Bradford and Nottingham being attached, so that the complete train leaves Grantham for the south made up to quite a respectable load. Sometimes, according to the particular run being made, the through station is used as a starting or terminating point, especially with more local services, such as Leeds to Doncaster and return or Leeds to Bradford and back. Further variety is added by the running of locals from King's Cross making several intermediate stops and then returning to the starting point.

To deal with the increased traffic additional engines have been acquired, both E220 Special Tanks, one in L.N.E.R. finish and the other L.M.S. The bulk of the long-distance main line trains however are still shared between the Hornby E320 "*Flying Scotsman*" and E220 "*The Bramham Moor.*" These two are used also in carrying out a specially exciting operation. This involves using the up and down tracks for traffic in one direction, there being a train on each, both supposedly heading northward. They represent respectively the peacetime 3.35 p.m. "Glasgow Goods" and the 4.0 p.m. "*Coronation.*" The goods pulls out of the long siding at the through station, which becomes King's Cross goods yard for the time being. It leads on to the up main track, and in the meantime the "*Coronation*" leaves King's Cross passenger terminus and, running on the down main track, overtakes the goods, to the great excitement of the operators!

Mr. Eagle tells us: "I could write a book on the trains we run. Although I worked on real railways for over 32 years, I never realised what fun and excitement could be had with a real model railway until I started this one."



An L.N.E.R. express on a Hornby layout. The engine is the 4-4-0 E220 Special "The Bramham Moor."

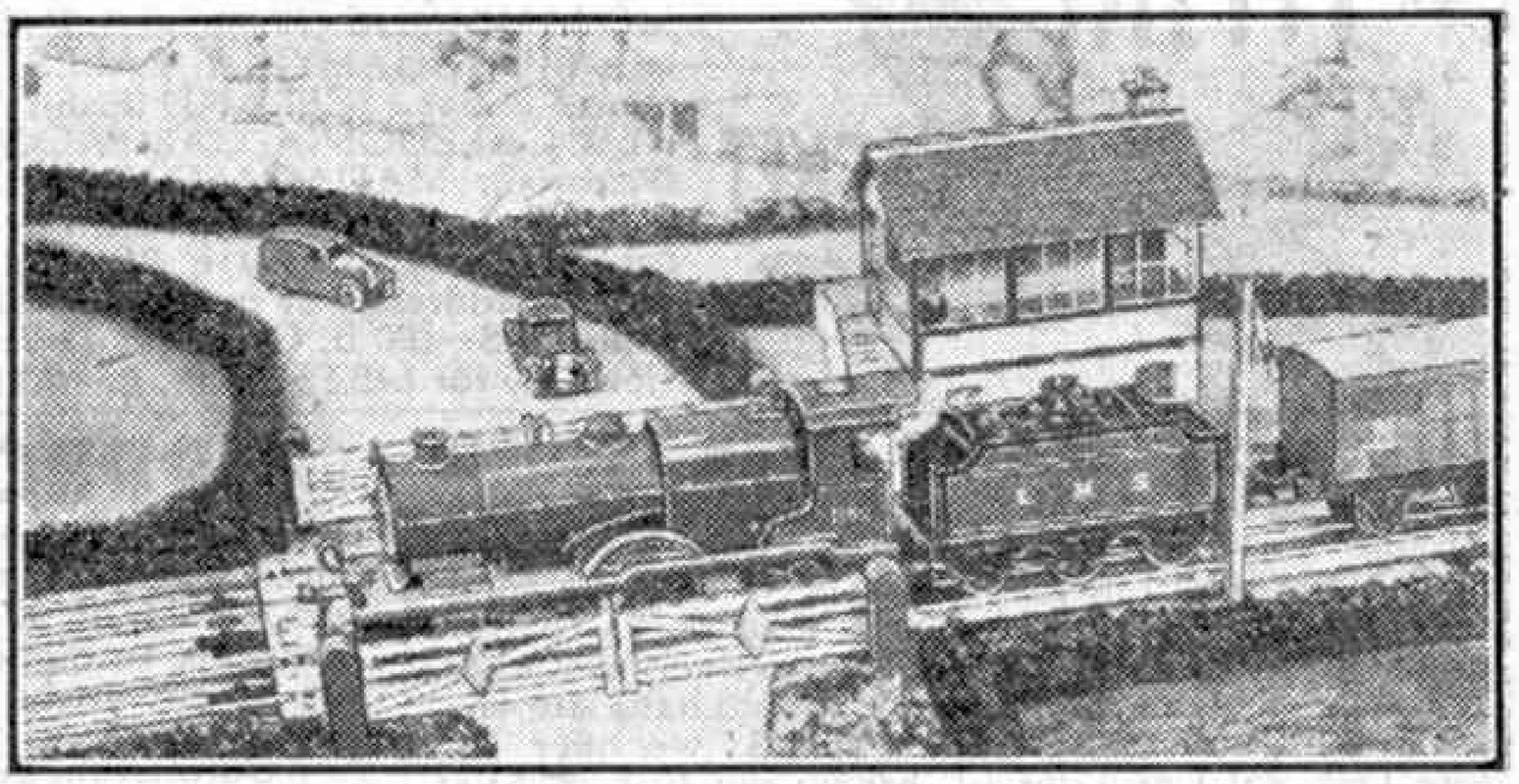
The Care and Use of Hornby Rolling Stock

IN normal times it is possible for the Hornby railway owner to select from the range of Hornby Rolling Stock vehicles suitable for practically any kind of train. Nowadays of course it is necessary to make do with whatever carriages and wagons we have. Often these are of widely different kinds as a result of the addition of odd vehicles, most of which have seen hard service on other lines.

Generally speaking, the faults normally encountered on used stock concern the couplings, the wheels and wheel frames, whether the vehicles in question are of the four-wheeled or the bogie type. Faults in couplings often take the form of bent coupling hooks. These bends can normally be dealt with by means of a pair of pliers. Care is necessary, naturally, as we do not want to make matters worse by breaking the hook right off. If the bending required is in the up or down direction we must take special care not to strain the eyelet or rivet by means of which the coupling is attached to the underframe of the vehicle. A missing loop in the case of automatic couplings, or a lost shackle with the plain type of hook, can be replaced fairly easily by forming up a new part from a piece of wire. The adjustment of the hook so that it stands straight out and lies fair with the couplings of other vehicles is important. Couplings that have become completely detached (if we havn't lost them) can be refitted by means of Meccano Bolts and Nuts, two of the latter being locked together to allow the coupling freedom of movement without the nuts coming loose.

Buffers that droop rather sadly, or which look anywhere but in the right direction, often do so because the buffer beams themselves are bent. Judicious re-bending of the beams will usually correct matters or at least improve them. The buffers themselves are best left alone as they cannot be replaced under present conditions; never try to bend them as they resent this treatment!

Wheels and wheel frames usually need cleaning, so that this operation should be carried out before any adjustments are attempted. Loose dust and so on can be brushed off, but any oily deposit is best wiped away. It is not difficult to remove the wheels of coaches or wagons, the wheel frames being sprung apart to allow the axles to be freed from the bearing holes. This will show up any bent axles and as a rule these can be put right with a pair of pliers, gently used. If tinplate wheels loose on the axles are being dealt with, and the wheels are slid off the axles for cleaning, we must take great care not to lose the little washers which should be found at the back of the wheels.



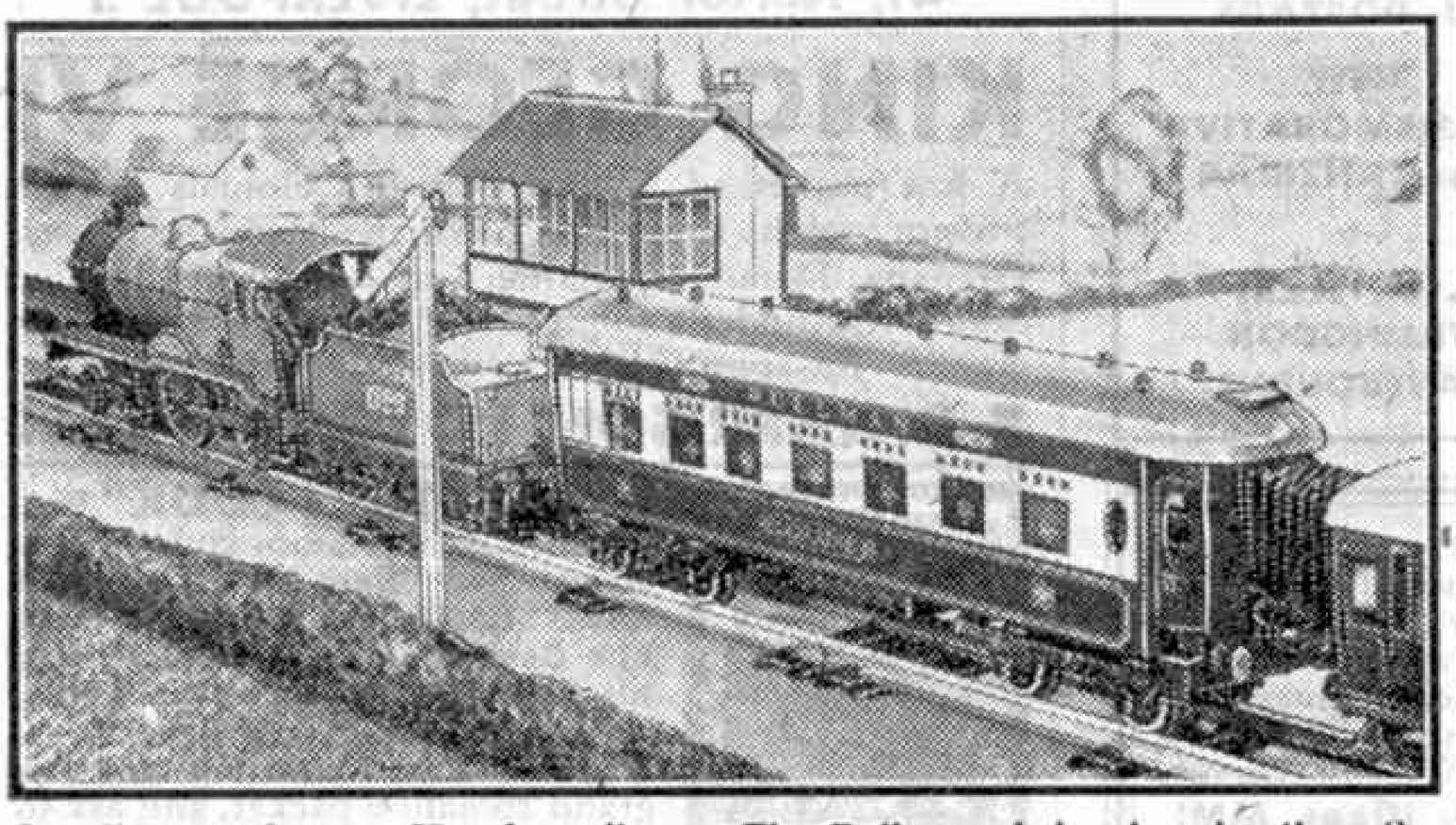
Over the crossing! A realistic scene on a Hornby layout showing a miniature Standard Compound at the head of a train.

Die-cast Mansell or spoked wheels rarely require more than a general clean, and a rag will usually do all that is necessary. When we replace the wheels between the frames we should make sure that the latter are fair and square so that the wheels can revolve freely; a little side play is an advantage but this should not be excessive.

Our stock now should be fit for satisfactory running and we can set about improving its appearance. General dusting and cleaning up with a soft cloth will make a good deal of difference. Whether the paintwork should be touched up depends on the condition of the vehicles and the skill and materials at the disposal of the owner. Finally, we can do a lot of good if we apply, very sparingly, to the bodywork some wax polish as used for furniture, and polish this up with a soft cloth, but not a "fluffy" one that will leave a trail of bits behind.

For passenger trains we should as far as possible run vehicles of similar types together. If we cannot carry this out fully we should try to keep the bogie stock together, and particularly to keep in separate sections the coaches with Mansell wheels and those with tinplate wheels. The latter should preferably be assembled behind the stock with the heavier wheels.

With goods vehicles the same thing applies, although we shall naturally have more variety of wagons and vans in a mixed goods train. Where odd vans are conveyed by passenger train they should if possible be fitted with die-cast wheels.



Speeding south on a Hornby railway. The Pullman, being heavier than the other stock, is marshalled next to the engine.

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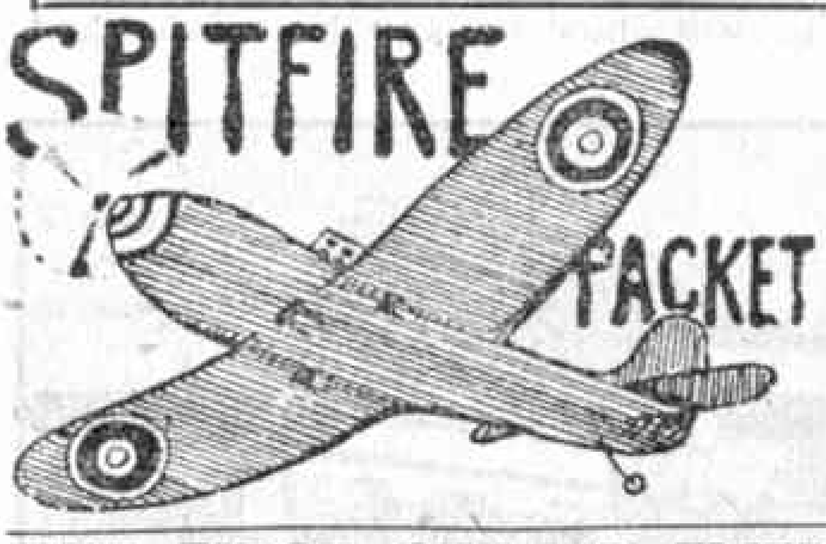

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For other Stamp Advertisements see also pages 104 and viii.

Stamp Collecting

How to Identify Stamps

By F. Riley, B.Sc.

FROM time to time I receive stamps from readers who wish to know in what country they were issued. It certainly requires a little experience to identify immediately every stamp that the collector may come across, but there are certain guides that are easy to learn, and I propose to go over a few of these. Fortunately most countries have their names on their stamps, which is very helpful to collectors. It is interesting to realise that Great Britain is an exception, the only words appearing on normal British stamps being "*Postage*" and "*Revenue*," and the second of these has often been omitted. Stamps made their first appearance in Great Britain, and are apparently still regarded here as a purely British institution. Fortunately no reader is ever in any trouble as a result of this omission, as British stamps are unmistakable because of the portraits they carry, and in many other instances portraits would be reliable guides if necessary. On what stamp but a German one, for instance, could the grim old face of Hindenburg appear?

The names of the countries that appear on stamps are not always in English form, but in certain cases a name that appears in some strange script is also given in English, as on the Siamese stamp illustrated on this page. In other cases the name is easily recognised. Good examples are the South African stamps on which the name appears as "Suid-Afrika," and the stamps of French Morocco, on which the name takes the form of "*Maroc.*" Other names that come to mind are "*Turkiye*," on Turkish stamps, and "*Lietuva*," on those of Lithuania. The second of these is an interesting example, as it is liable to give rise to confusion with the stamps of Latvia, which seems to be the nearest English equivalent. Latvian stamps however carry the name "*Latvija*," or sometimes "*Latwija.*"

In many instances the full name of the issuing country does not appear on stamps, initials of some kind being used instead. Some of these should be known to the youngest stamp collector, and fortunately are easily learned. The two most familiar examples are "*U.S. Postage*," which appears on the stamps of the U.S.A., and "R.F.," the initials of the words "*Republic Francaise*," which distinguishes the stamps of France. French stamps usually carry the word "*Postes*," which is a good guide also to the stamps of the French Colonies and dependencies.

Another example that is not quite so straightforward, but is known to practically everybody, is provided by Russia. The official name for this country is Union of Soviet Socialist Republics, and the initials of this title in its Russian form appear on Russian stamps. The Russians use Eastern script, and not the Roman script to which we are accustomed, and these initials take the form of "C.C.C.P." They are easily learned, as are the initials "P.C.C.P." that were used in Soviet Russia prior to 1923.

Other interesting examples of the use of Eastern script come from the Balkans. Greek stamps carry the Greek name of the country in this script, which appears as "ΕΛΛΑΣ," as seen on the Greek stamp illustrated on page 105. The stamps of Crete carry the strange inscription "KPHTH," which to us is meaningless, but is simply the name of the island in Greek lettering. Bulgarian stamps also carry the name of the country issuing them in the same script, as do those of Jugoslavia. Both are easily learned sufficiently to allow identification, and to make matters a little simpler there is a tendency in recent stamps to include the name also in Roman script, a tendency that is particularly noticeable in the stamps of Jugoslavia.

Although very few of my readers are familiar with Arabic script, all can recognise scripts of its type, and seeing one on a stamp will send them to search among the countries where such scripts are used. Those using Arabic script include Egypt, Syria, Turkey and Arabian countries, most of which have other features, such as names, portraits and designs, by which they can be recognised. The Persian 1.50 T stamp illustrated on this page is another good example of this kind. The strange characters, similar in appearance to Arabic, seen below the two portraits on this stamp, presumably mean Persia or Iran, and they can be found on practically all modern stamps of that country. Those who are interested in the stamps issued there will have no difficulty in recognising the inscription when they see it, and keen stamp collectors who are only just beginning the hobby would have little more difficulty in learning it.

Here I should point out how useful good catalogues are. Those of Stanley Gibbons and Whitfield King illustrate stamp designs fully, and the collector can identify an unknown stamp definitely by finding its reproduction in them. The hints I give in this article will be useful in pointing to possible countries, and so speeding up the search, and in any case a reference to the catalogue is always desirable. Even if this is not absolutely necessary for identification, it is as well to provide confirmation by comparison of detail, and the collector will also gather much useful information from his search.

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For other Stamp Advertisements see also pages 102 and viii.

Stamp Gossip
and Notes on New Issues

By F. E. Metcalfe

ONE likes to give pride of place to British Colonial stamps, when discussing the month's new issues, but this time the honour simply must go to the new stamp issued in London by the Polish Government, in honour of those great countrymen of theirs who rose last year in Warsaw, to help throw the Germans out of their beloved city. Political issues are not the concern of stamp collectors or writers, and it would be as well if we all remembered that; but we cannot help feeling reverence for gallant patriots who freely lay down their lives, so that their country might live. That is the only issue for us, and we must, as stamp collectors, feel honoured that the Polish Government thought fit to show their appreciation by the issue of a postage stamp, the one we are illustrating this month. Moreover it is a pleasure also because the stamp itself is worthy of the cause, and not like some of the rubbishy designs that have recently emanated from London. Although 100,000 copies of the stamp have been printed, such will be the demand for this stamp that it is likely to rise very much in price. It should therefore be bought as soon as possible by any interested collector.

In this connection it may be mentioned that a reader of one of the stamp papers has written to say that a used set of the Polish "Monte Cassino" overprints, recently being offered over here for a few shillings, is making £10 in Belgium.

Another foreign stamp we are illustrating comes from Greece. If readers will notice the figures at the right bottom corner they will see that they amount to two million, and it took two of these stamps to send an ordinary letter to Great Britain. The peacetime value of that most historical monetary unit in the whole world, the drachma, was about 10d., and it took four million of them to send a letter! It may even take four hundred million now. That kind of thing might have happened in our own country, but for Providence and stout arms. Maybe when we are grumbling about the quality of the stamp mounts we have to use in these days, and when our favourite dealer has run out of album leaves, we might reflect that there are other worries in the world.

The third foreign stamp to be shown this month is a quaint item from Argentina. Quaint is the word. We have seen better designs on tram tickets, and yet the cause is worthy enough. The stamp has been emitted in honour of the Argentina reservists, a body of men of fine physique, as the writer of this can testify from personal experience.

Maybe it was thought that it takes all kinds to fill a stamp album, which can be the only logical excuse for many stamps issued these days; on the other hand it must be admitted that some of the designs of modern stamps, particularly those of France, Germany and Holland, are simply magnificent, and collectors who are interested in artistic productions are in for a treat when all the present upset is over.

And now to our own colonials. The first stamp that calls for our attention is the new 14 a. of Aden, which has been issued to cover the air mail rate from Aden to our own country. It is in consequence an *air mail stamp*, though not thus described, and can be added to the relatively recent 1/3 values of Gold Coast, Nigeria and Sierra Leone, all in West Africa. Air mail stamps were popular right from their advent, and collectors of British Colonial stamps felt out of it, but this seems to be changing. After the war our colonies, at least as much as other countries who will no doubt be using aeroplanes for the transport of mail, may be allowed to issue full sets of air mail stamps. Apart from any other consideration these have a great propaganda value, as the rest of the world has long since discovered.

On 9th February the 6d. and 1/- stamps of Turks and Caicos Islands came out in their new colours, sepia and olive green respectively, and such was the demand for the now obsolete pair, accentuated by lack of stock in the island post offices, that they are now selling for 12/6. Some collectors are wondering if these prices are inflated, and if they will drop after the war. Without knowing just what post-war conditions will be like, one cannot say for certain, but unquestionably stamps of the current reign are at least as likely to keep up as are any other groups. We will have to leave the amplification of this interesting subject to some other time.

The Indian Office has advised of the issue of a set of official postage stamps for the state of Bahawalpur, an Indian state in the Punjab. The stamps are only for official use in the state.

And now for our monthly tip. Be sure and buy—or beg—a pair of the South West Africa bantams 1/- value, with large overprint. Don't be afraid, if you can afford it, to pay a few shillings. You won't get them else, and you won't be sorry in the long run.

Fighters of the Red Air Force—

(*Continued from page 81*)

radial engine, which has increased the speed to 385 m.p.h. The fire-power has also been stepped up by the inclusion of two 20 mm. cannons and two machine-guns. Compared with other recent Allied fighters, the speed of the LAGG-5 may seem low, but the Germans learned in 1940 that a high speed alone will not win battles. Like "the Few" in the Battle of Britain, the Russians have proved that ingenuity in attack and cool courage often produce better results. They hunt the Luftwaffe relentlessly and, when their ammunition has been expended, do not hesitate to ram an enemy bomber and then bale out. Indeed this ramming has become a recognised tactic in Russian air fighting, and several pilots have quite a "bag" of enemy bombers destroyed in this way. Another tactic that occasioned much wailing over the German radio is the pleasant habit that some Russian pilots have of flying up behind a German aeroplane and then chewing off the Nazi tail with an "armoured" airscrew. But such wailing is hardly likely to deter the Russians.

Facts about Steel—

(*Continued from page 85*)

heat from the steel, and generally adds to the expense of production. Sometimes, too, carbon in the steel is found to combine with elements in the furnace atmosphere, and the withdrawal of carbon from the steel means that it becomes "decarburised," that is it has a soft skin, which is a nuisance. Before ever the steel can be made into tools or other parts, this soft skin has to be ground off. If a part or tool is required to exact dimensions, the presence of this soft skin means that the finished part will be less than the size required, since so much will have to be ground off.

For these and other reasons it is usual to build modern furnaces with what is termed "controlled atmosphere" arrangements. This means that only certain neutral gases, that is those not attacking the steel in any way, are admitted into the heating chamber, so that the steel comes out of the furnace as clean as it went in. Careful control of these gases is achieved in a number of ingenious ways. Oxygen is kept out altogether, as this element is the most active inside the heating chamber in attacking the steel.

You will now have learned why steel has to be heat-treated and what this treatment does. In a further article I shall explain the modern stainless and heat-resisting steels, which are one of the most famous and valuable steel discoveries of the last 20 or 30 years.

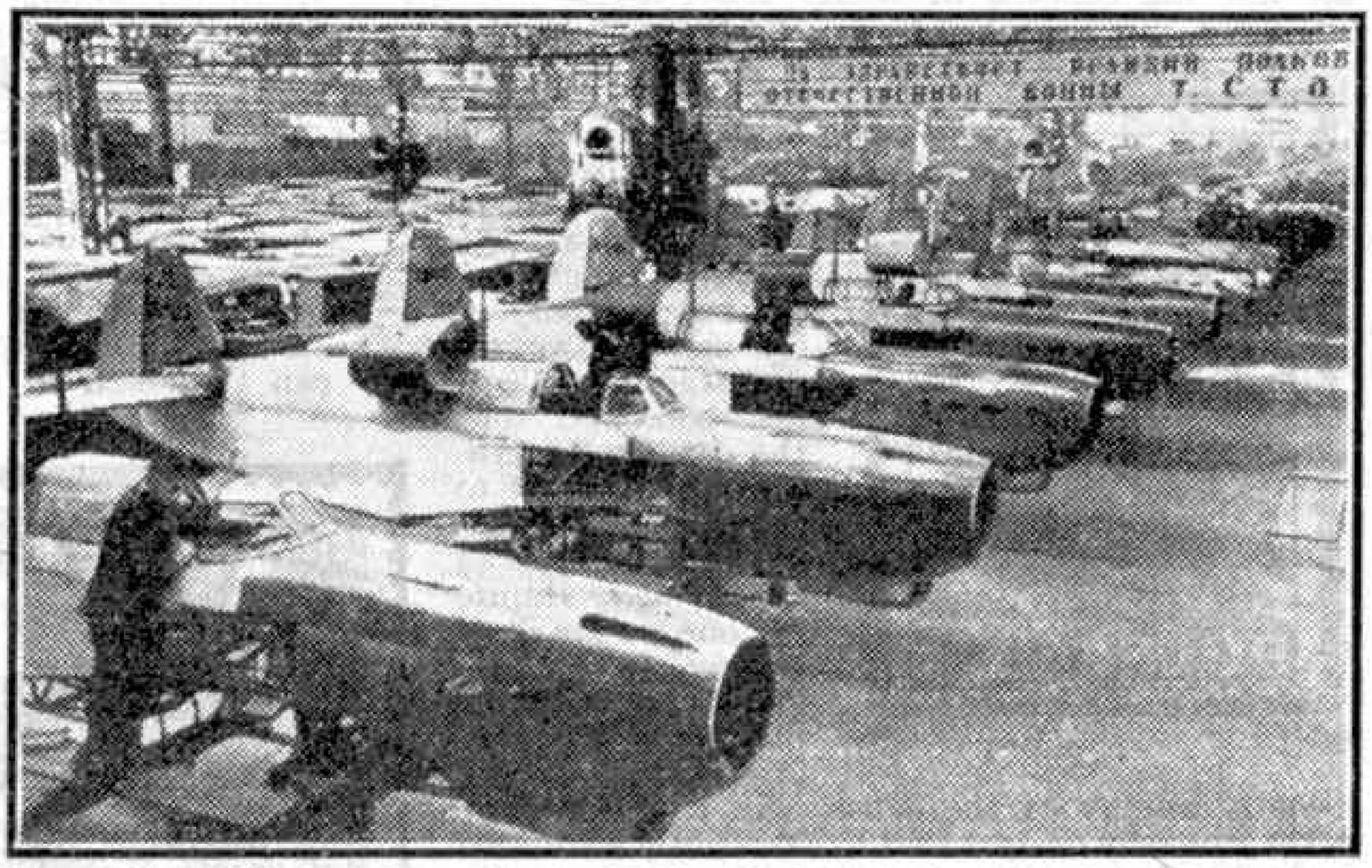
NATIONAL MODEL AIRCRAFT COMPETITIONS

The closing date in the National Competitions organised by the Association of British Aeromodellers is 31st March. In these competitions, the largest in scale yet arranged in Great Britain, a large number of valuable silver trophies and more than £350 in cash are offered in prizes. There are eight contests, covering every phase of model aeroplane construction and flying, and those interested can obtain full details and standard entry forms from the Secretary, the Association of British Aeromodellers, 28, Hanover Street, London W.1. Applications should be accompanied by a stamped self-addressed envelope.

Prize-winners in "Meccano Toy" Competition

The "Meccano Toy" Competition was announced in the November 1944 "*M.M.*," and in it prizes were offered for simple mechanical toys constructed from Meccano parts and suitable for amusing young children. The best entries were received from the competitors named in the following list, who have been awarded prizes as indicated:

SECTION "A"—First Prize, £2/2/-: J. A. Dale, Hatfield; 2nd, £1/1/-: J. A. Kennett, Gerrards Cross; 3rd, 10/6: T. Waite, Wakefield. Consolation Prizes of 5/-: G Findlay, Ilkley; J. Thompson, Glasgow; R. Berney, Sheffield.



Assembling Yak-I fighters in the Soviet X aircraft factory, for the Red Air Force. (See special article on page 80).

SECTION "B"—First Prize, £2/2/-: J. Draper, Worcester Park; 2nd, £1/1/-: T. Pickard, Sutton, Surrey; 3rd, 10/6: G. B. Rogers, Hull. Consolation Prizes of 5/-: G. Bishop, Middlesbrough; J. Ambrose, Ely; M. Bleckwen, Feltham, G. Norton, Nottingham.

The entry I liked best was an amusing robot marionette, which was capable of performing all kinds of funny antics. It was built by J. A. Dale, Hatfield, and was about 18 in. in height. Every limb was fully pivoted in all its joints, and the ankles, knee, thigh, elbow, shoulder and neck, etc., were all operated by pulling strings attached to them. This model was awarded First Prize in Section A.

An exciting horse race game and a see-saw both of which were worked by a clockwork motor, were sent by J. A. Kennett, Gerrards Cross, and won for him the Second Prize in Section A.

A simple horse and cart with driver was the entry submitted by J. Draper, Worcester Park, who won the First Prize in Section B. In a rather ingenious manner the lash of the driver's whip is passed through a Boiler forming the animal's body, and tied to one of its fore-legs, which it pushes up and down when the model is pushed along.

Tony Pickard, Sutton, won Second Prize in Section B for a toy acrobat operated by pulling strings.

COMPETITION RESULTS (HOME)

November "Meccano Parts" Contest.—1st Prize: F. Linton, Mirfield; 2nd Prize: R. H. Oldroyd, Erdington; 3rd Prize: H. A. Gundry, Twickenham. Consolation Prizes: D. D. Briggs, Kettering; G. Harden, London S.W.18; T. D. Tasker, Barnsley.

December "Advertisement Letter Square" Contest.—1st Prize: H. Boyd, Glengormly; 2nd Prize: D. S. Gray, Upwell; 3rd Prize: T. Cox, Chesterfield. Consolation Prize: D. B. Appleyard, East Ardsley.

Competitions! Open To All Readers

What Locomotives are These?

It is a long time since we gave readers the opportunity of taking part in a competition that involves finding locomotive names to which simple clues are given, so here is one. In the panel in the centre of this page is a series of phrases and sentences, 20 of them altogether, each of which points directly to the name of a locomotive belonging to one of the four British railways. The clues are similar to those usually given in crossword puzzles. Some are easy, but others will tax entrants just a little. All are very interesting, and it will be fun to track down the names of the locomotives concerned in any of the well-known lists of named British engines, if indeed any readers require the aid of such lists!

In order to make the idea clear we may take the first clue "A Royal home." Thinking over Royal homes in this country we are led naturally to "*Sandringham*," which is not only the name of a locomotive but also that of a class on the L.N.E.R. The solution here therefore is L.N.E.R. No. 2800 "*Sandringham*." In all cases the owning company and number should be given as well as the name, as in this case.

1. A Royal home
2. Building celebrated in song
3. Named after its father
4. Maps and mountains
5. Follows the plough
6. Famous ship and bridge builder
7. Has wings with which to fly
8. Should its colour be green?
9. A much prized fur
10. A holiday present
11. Guide in the night sky
12. The only one of his name
13. Now stood down
14. Scene of a British victory
15. A vain bird
16. Sounds gas fired
17. The lady is not Belgian
18. Of Roman origin
19. A prairie capital
20. An eastern port

The contest is divided into the usual two sections, for Home and Overseas readers respectively. In each prizes to the value of 21/–, 15/– and 10/6 will be given, and there will be consolation prizes of 2/6 each for other solutions that are worthy of recognition. If there is a tie for any prize neatness and novelty will be taken into consideration.

Entries in this contest must be addressed: "*March Locomotive Contest, Meccano Magazine, Binns Road, Liverpool 13.*" The closing dates are: Home Section, 30th April; Overseas Section, 31st October.

"Go As You Please"

Nearly two years ago we introduced to our readers a competition in which they could submit as entries almost anything they wished. Under the name of "*Go As You Please*" Contest this proved very successful indeed, and this month we are giving readers a second opportunity of this kind.

The point about this contest is that no reader will be able to excuse himself for not sending in an entry by saying that he is not "good at that sort of thing," as he is invited simply to let us see what he *is* good at. Those who draw or paint will immediately set to work with glee to produce entries with brush or pencil. Those who cannot do this, but can write, may send in some original essay or story, or even poetry! Anything is acceptable in a go-as-you-please contest, and every entry will be considered on its merits. Puzzles, either of well-known types such as crosswords or new kinds, and even suggestions for new contests, would form suitable entries, and there is nothing to prevent readers from submitting specimens of their own production if their hobbies are constructional, provided that these specimens are not bulky. If they are, photographs, drawings or descriptions should be submitted, care being taken to emphasise features showing novelty or originality. The only exceptions to the "go-as-you-please" idea are photographs and Meccano models; these are provided for in other contests announced in this issue.

The decision of the judges will be based, not on the nature of an entry, but on the ingenuity and skill shown in putting an idea into practice. They will also take into consideration the ages of competitors.

In each of the two sections, for Home and Overseas competitors respectively, into which this Contest is divided there will be three prizes, of 21/–, 15/– and 10/6, and in addition there will be special prizes for other entries that are really novel and well worked out. Competitors must take the greatest care to write their names and addresses, with their ages, very clearly on the backs of the actual entries where this is possible. If they have to be written on separate slips of paper these must be firmly attached. Closing dates: Home Section, 30th April; Overseas Section, 31st October.

March Photographic Contest

This month's photographic contest is the 3rd of our 1945 series, and in it, as usual, prizes are offered for the best photographs of any kind submitted. There are two conditions—1, that the photograph must have been taken by the competitor, and 2, that on the back of the print must be stated exactly what the photograph represents. A fancy title may be added if the entrant desires.

Entries will be divided into two sections, A for readers aged 16 and over, and B for those under 16. They should be addressed: "*March Photo Contest, Meccano Magazine, Binns Road, Liverpool 13.*" There will be separate sections for Overseas readers and in each section prizes of 15/– and 7/6 will be awarded. Closing dates: Home Section, 31st March; Overseas Section, 29th September.

Fireside Fun

Mrs. Pondersly-Smyth: "And then, Mary, I want you to stand at the drawing room door and call the guests' names as they arrive."

Mary: "Yes, mum. I suppose the first thing that comes in my head to say about them will do."

* * * *

Bus Conductress: "All you folk hanging on the steps get off. This is a bus, not a flypaper."

* * * *

"I'd like to see an evening dress that would fit me."
"So would I, madam."

* * * *

"You don't look well. You should take a holiday."
"I'd like to, but I can't stay away from work."
"Why, can't they do without you?"
"Of course, but I don't want them to find out."

* * * *

Rufus was sadly tying a handkerchief round his hand when the sawmill boss came back.

"Hullo," said the boss. "What have you been doing now."

"Big saw cut ma finger off, sah."

"How did that happen?"

"Dunno, sah. I just touched de darn saw, like dis—Lord, dere goes anudder!"

* * * *

THIS MONTH'S HOWLER

Contralto is a low kind of music that is sung only by ladies.

* * * *

"My daddy's a policeman too, but he isn't mounted like that one. I wish he was."

"Why."

"Well, when there's trouble he could get away quicker."

BRAIN TEASERS

FIGURE THIS OUT

Can you arrange 18 dots in 8 lines of 5 dots each?

P.J.C.

* * * *

THIS HAS BEEN SOLVED

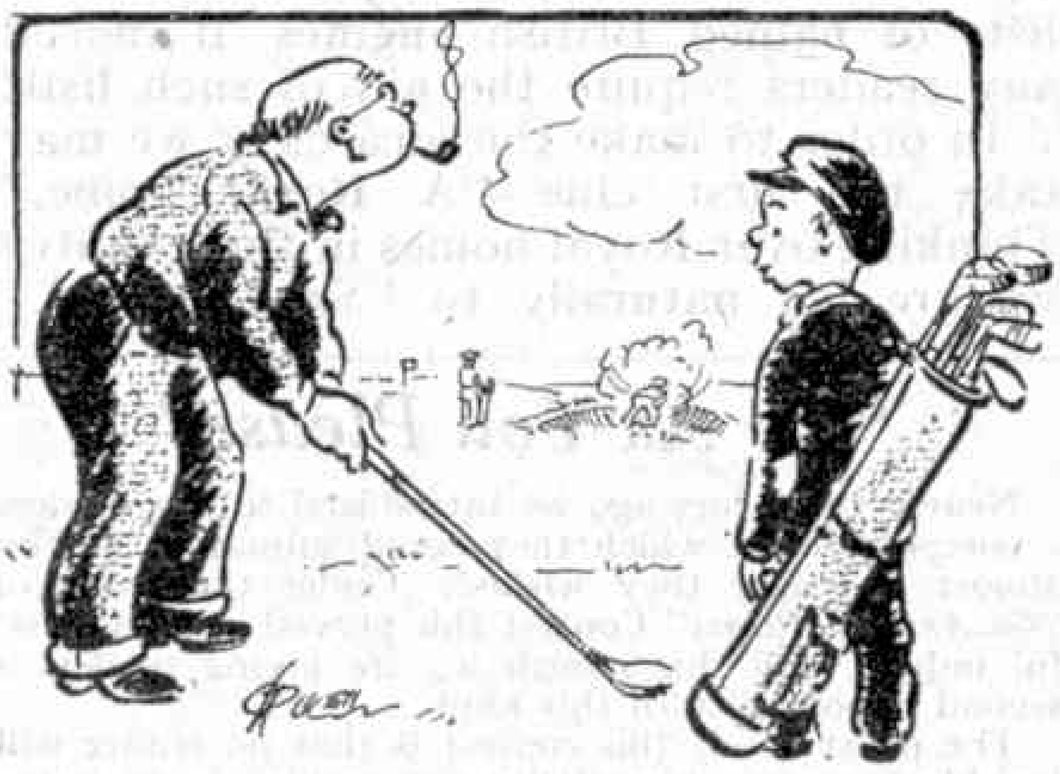
After this teaser a straightforward calculation will be welcome. A market gardener keeps one in every 200 of his bean pods for next year's seed, and there are eight times as many pods per plant as there were beans in each pod. If all the seeds germinate he always gets the same number of plants each year. How many beans are there in each pod?

T.K.C.

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

The directions that an aeroplane would take from London to the four cities named in our first teaser last month cannot be found by reference to an ordinary map of the world, as this is a projection. The best way is to use a globe and stretch a piece of string tightly between the beginning and end of each journey, for this gives the great circle course, as it is called, which represents the shortest distance over the curved surface of the Earth. It is then found that an aeroplane from London bound for Tokyo by the shortest route would travel north eastward, passing over Finland, Murmansk and Northern Siberia. An aeroplane bound similarly for Auckland, New Zealand, would pursue a course slightly to the south, passing over Japan and the Solomon Islands in the Pacific. The course for Winnipeg crosses Mull of Galloway to the southern end of Greenland, and from there goes over Hudson Bay, while an aeroplane bound for Bombay crosses Northern Germany, the Crimea, the Caucasus region of South Russia and Iran.



"Isn't Major Pepper out of that bunker yet, caddie? How many strokes has he had?"

"Fifteen ordinary, Sir, and one apoplectic."

* * * *

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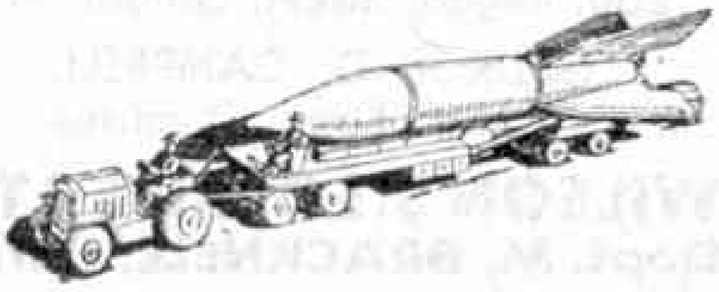

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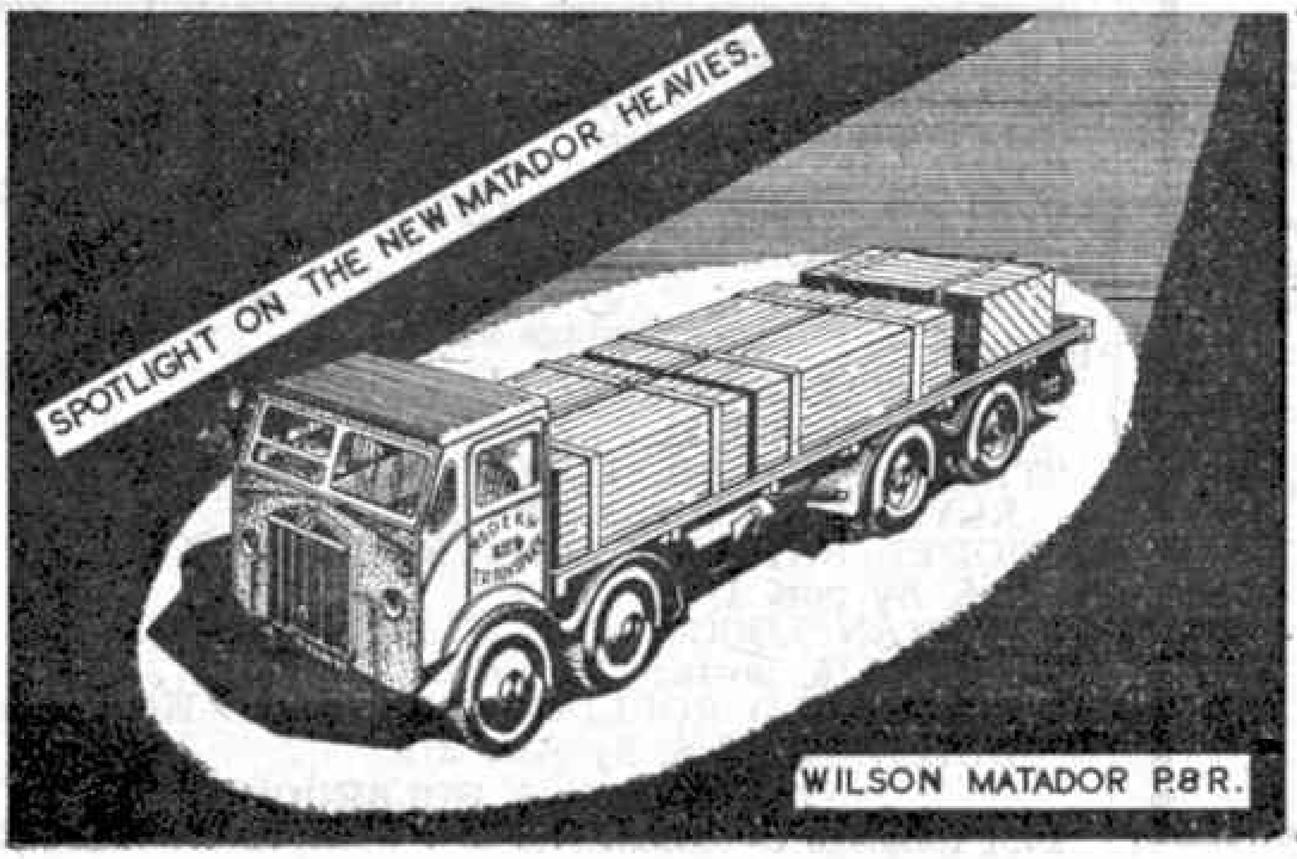

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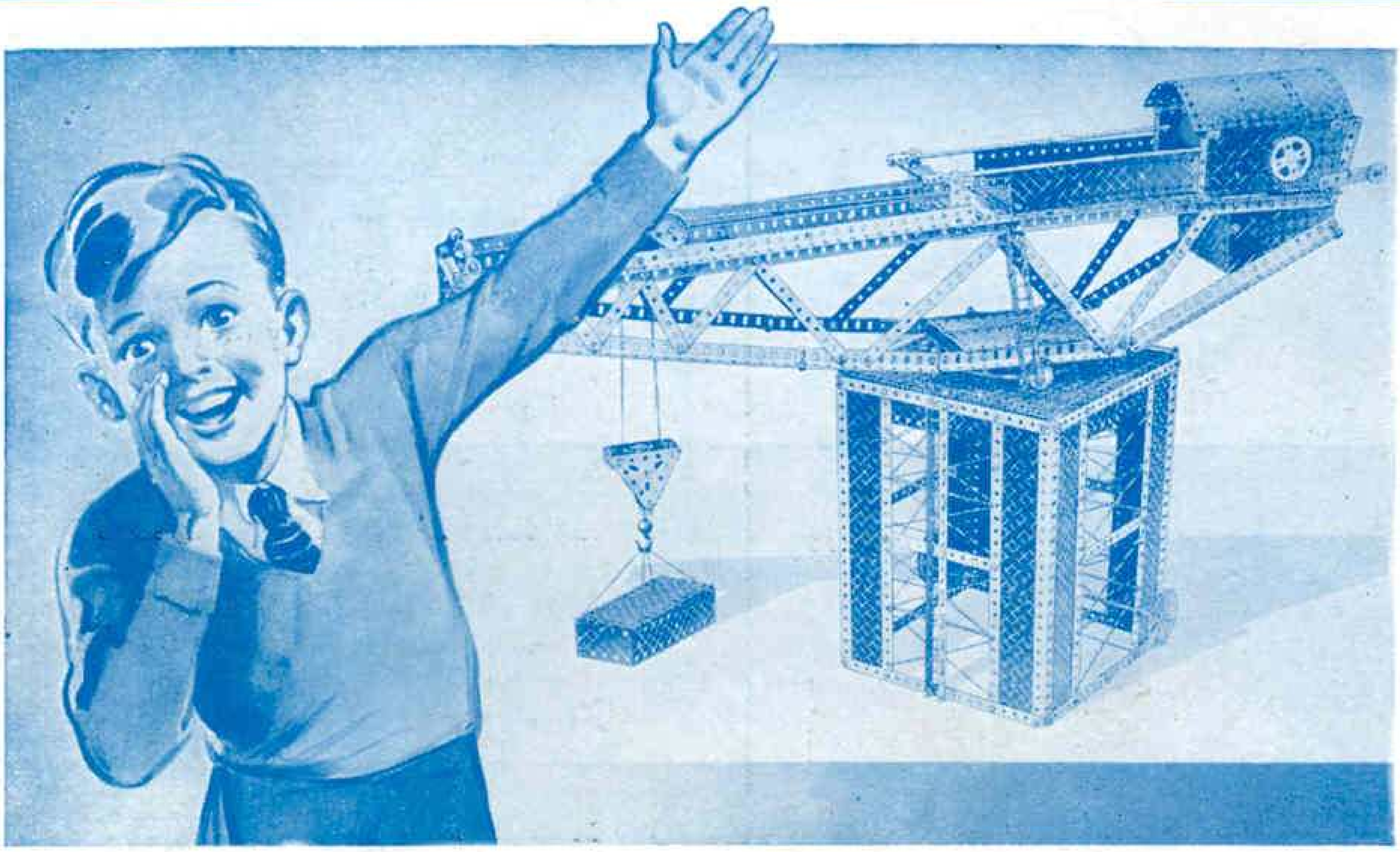

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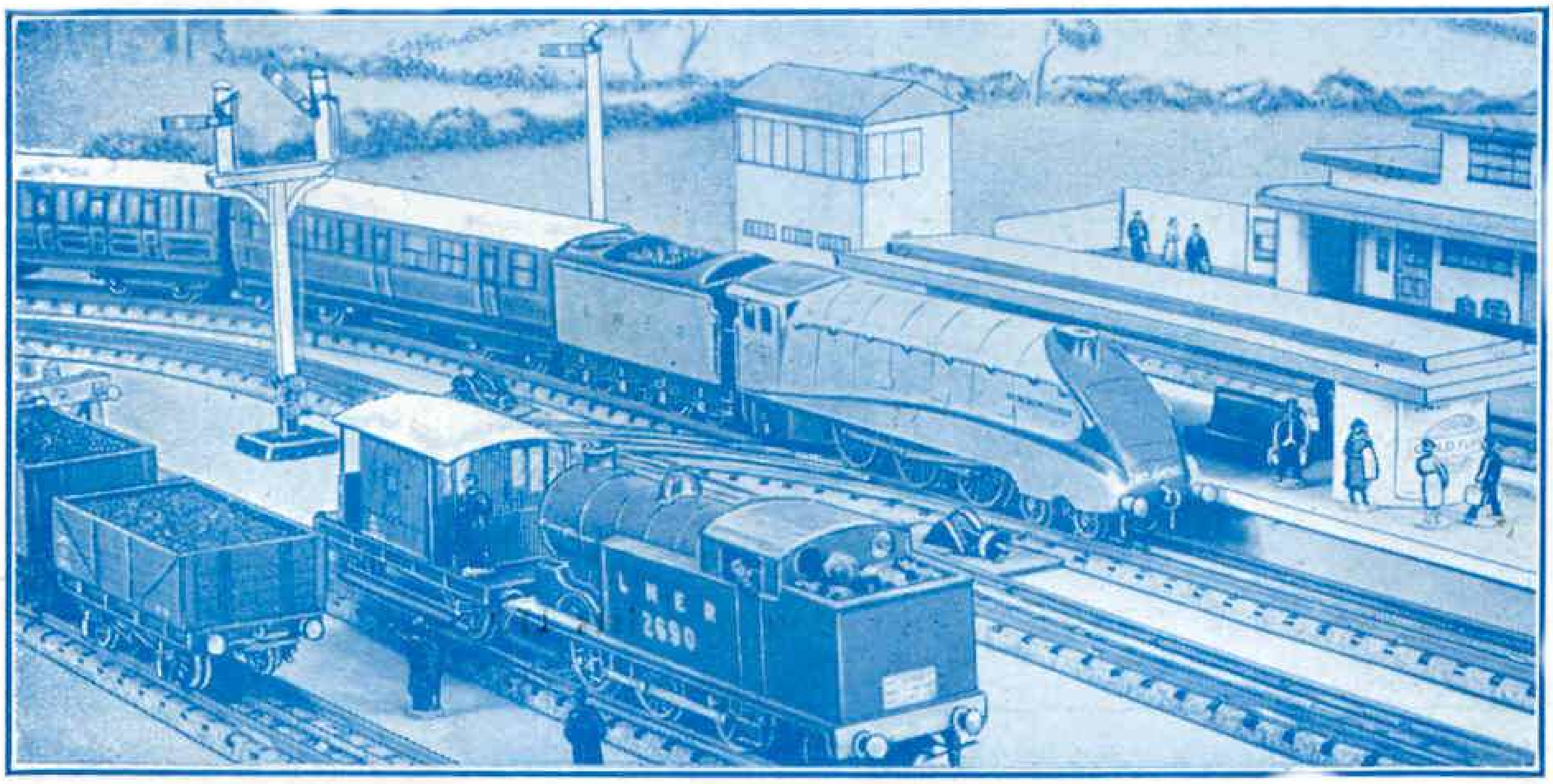

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